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**SECTION 00 3132**  
**GEOTECHNICAL DATA**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. The following pages contain the Preliminary Geotechnical Engineering Study, CMT project number 19898 and Addendum Letter No. 1, prepared by CMT Engineering Laboratories, 707 24<sup>th</sup> Street, Suite1A, Ogden, Utah 84401.
- B. Neither the Owner nor Architect guarantee that materials other than those disclosed by the test borings will not be encountered or that proportions of the various materials will not vary from those indicated.
- C. Soils investigation provides Owner's information for Bidders' convenience and is intended to supplement rather than serve in lieu of Bidders' own investigations
- D. Bidders must read and familiarize themselves with the Geotechnical Study and visit the site.

**1.2 DATES OF STUDIES**

- A. Original study is dated April 19, 2023; addendum letter is dated May 10, 2023.

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## SECTION 00 5433

### AGREEMENT CONCERNING DRAWING FILES ON ELECTRONIC MEDIA

#### PART 1 - GENERAL

##### 1.1 AGREEMENT CONCERNING DRAWING FILES ON ELECTRONIC MEDIA

- A. The electronic files will be distributed from the Architect to the Construction Manager/General Contractor only once the following form has been signed. It will be the General Contractor's responsibility to control distribution.
- B. Valentiner Crane Brunjes Onyon Architects, L.L.C. (the Architect) does not assume any responsibility for the accuracy of the information contained in these drawing files. Any and all users are aware that differences may exist between the electronic files delivered and the printed hard-copy construction documents. In the event of a conflict between the signed and sealed hard-copy construction documents prepared by the Architect and the electronic files, the signed or sealed hard-copy construction documents shall govern.
- C. Any and all users who may obtain these drawings **from the Construction Manager/General Contractor** under this agreement, including but not limited to, subcontractors, vendors, suppliers etc., agree to indemnify and hold harmless the Architect, its officers, directors, employees and sub-consultants against all damages, liabilities or costs, including reasonable attorneys' fees and defense costs, arising from any changes made by anyone other than the Architect or from any transfer or reuse of the electronic files including data contained in the files without the prior written consent of the Architect.
- D. Building Information Model (BIM) drawing files will be made available to the Construction Manager/General Contractor and its subcontractors for the purposes of preparing submittals for their portion of the work **only** after the "Agreement Concerning Drawing Files on Electronic Media" has been signed by the Construction Manager/General Contractor.

#### PART 2 - PRODUCTS - Not Used

#### PART 3 - EXECUTION – Not Used

END OF SECTION

**AGREEMENT CONCERNING DRAWING FILES ON ELECTRONIC MEDIA**

Valentiner Crane Brunjes Onyon Architects, L.L.C. (the Architect) does not assume any responsibility for the accuracy of the information contained in these digital models. Any and all users are aware that differences may exist between the electronic files delivered and the printed hard-copy construction documents. In the event of a conflict between the signed and sealed hard-copy construction documents prepared by the Architect and the electronic files, the signed or sealed hard-copy construction documents shall govern.

**Any and all users who may obtain these digital models from the Construction Manager/General Contractor under this agreement, including but not limited to; subcontractors, vendors, suppliers etc., agree to indemnify and hold harmless the Architect, its officers, directors, employees and sub-consultants against all damages, liabilities or costs, including reasonable attorneys’ fees and defense costs, arising from any changes made by anyone other than the Architect or from any transfer or reuse of the electronic files without the prior written consent of the Architect.**

Under no circumstances shall delivery of the electronic digital models be deemed a sale by the Architect, and the Architect makes no warranties, either express or implied, of merchantability and fitness for any particular purpose. In no event shall the Architect be liable for any loss of profit or any consequential damages as a result of the use or reuse of the electronic files.

The digital Building Information Models provided will contain information as provided on construction documents. The user shall remove all notes, text, detail cuts and member designations from the electronic file prior to use. If used as submittal documents, submittals will be rejected as non-compliant. The drawing files provided by VCBO may not be reproduced or distributed to individuals outside the company or collective organization signing this agreement.

**LIST OF DRAWINGS:**

Project Name: **Ogden School District Hillcrest Elementary Replacement**  
VCBO Project # **22785**

List of Revit Models: **Architectural, Structural, Mechanical and Electrical.**

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**ACCEPTANCE OF TERMS, CONDITIONS & LIMITATIONS:**

\_\_\_\_\_  
Name of Company/Contractor

\_\_\_\_\_  
Signature of Company/Contractor Representative

\_\_\_\_\_  
Printed Name of Individual Signing

\_\_\_\_\_  
Position/Title

\_\_\_\_\_  
Date

**This agreement must be signed and returned to VCBO prior to release of any electronic document.**

**SECTION 00 6276.13**

**EXEMPTION CERTIFICATE**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Construction materials purchased by or on behalf of the **Ogden School District** *may be* exempt from Utah Sales and Use Tax Act. Tax Exempt Form TC-721G must be used by the vendor when purchasing construction materials for all School District projects. A completed copy of Form TC-721G follows this cover page.

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Utah State Tax Commission

# Exemption Certificate for Governments & Schools

(Sales, Use, Tourism and Motor Vehicle Rental Tax)

TC-721G

Rev. 3/16

|  |  |                                     |                   |
|--|--|-------------------------------------|-------------------|
| Name of institution claiming exemption (purchaser)<br>BOARD OF EDUCATION OF OGDEN CITY SCHOOL DISTRICT |  | Telephone Number<br>801-737-7300    |                   |
| Street Address<br>1950 MONROE BLVD.  |  | City<br>OGDEN                       | State<br>UT       |
| Authorized Signature<br>   |  | Name (please print)<br>KEN CRAWFORD | ZIP Code<br>84401 |
| Name of Seller or Supplier:<br>Hughes General Contractors  |  | Title<br>DIRECTOR, SUPPORT SERVICES |                   |
|  |  | Date<br>12/19/2018                  |                   |

The person signing this certificate MUST check the applicable box showing the basis for which the exemption is being claimed.

Email questions to [taxmaster@utah.gov](mailto:taxmaster@utah.gov). You may also write or visit the Tax Commission at 210 N 1950 W, Salt Lake City, UT 84134, or call 801-297-2200 or toll free 1-800-662-4335.

**DO NOT SEND THIS CERTIFICATE TO THE TAX COMMISSION**  
Keep it with your records in case of an audit.

**UNITED STATES GOVERNMENT OR NATIVE AMERICAN TRIBE**  
I certify the tangible personal property or services purchased are to be paid directly with funds from the entity noted on this form and will be used in the exercise of essential governmental or tribal functions.  
**NOTE:** Includes sales of tangible personal property to federally chartered credit unions. "Directly" does not include per diem, entity advances, or government reimbursements for employee credit card purchases.

**UTAH LOCAL GOVERNMENTS AND PUBLIC ELEMENTARY AND SECONDARY SCHOOLS**  
Sales Tax License No. 12057251-002-STC  
I certify the tangible personal property or services purchased are to be paid directly with funds from the entity noted on this form and will be used in the exercise of that entity's essential functions. For construction materials, if the purchaser is a Utah local government, these construction materials will be installed or converted into real property by employees of this government entity.  
**CAUTION:** This exemption does not apply to government or educational entities of other states and is not valid for lodging-related purchases.

**CONSTRUCTION MATERIALS PURCHASED FOR SCHOOLS OR PUBLIC TRANSIT DISTRICTS**  
I certify the construction materials purchased are on behalf of a public elementary or secondary school, or public transit district. I further certify the purchased construction materials will be installed or converted into real property owned by the school or public transit district.  
Name of school or public transit district:  
Ogden City School District  
Name of project: HILL CREST ELEMENTARY REPLACEMENT

**UTAH STATE GOVERNMENT**  
Sales Tax License No. \_\_\_\_\_  
I certify the tangible personal property or services purchased are to be paid directly with funds from the entity noted on this form and will be used in the exercise of its essential functions. For construction materials, they will be installed or converted into real property by employees of this government entity.  
**CAUTION:** This exemption does not apply to other states and is not valid for lodging-related purchases.

**FOREIGN DIPLOMAT**  
I certify the purchases are authorized by a diplomatic tax exemption card issued by the United States.  
Foreign diplomat number: \_\_\_\_\_

**HEBER VALLEY HISTORIC RAILROAD**  
I certify these purchases and sales are by the Heber Valley Historic Railroad Authority or its operators and are related to the operation and maintenance of the Heber Valley Historic Railroad.

To be valid this certificate must be filled in completely, including a check mark in the proper box.

A sales tax license number is required only where indicated.

Please sign, date and, if applicable, include your license or exemption number.

**NOTE TO SELLER:** Keep this certificate on file since it must be available for audit review.

**NOTE TO PURCHASER:** Keep a copy of this certificate for your records. You must notify the seller of cancellation, modification, or limitation of the exemption you have claimed.

If you need an accommodation under the Americans with Disabilities Act, email [taxada@utah.gov](mailto:taxada@utah.gov), or call 801-297-3811 or TDD 801-297-2020. Please allow three working days for a response.

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**SECTION 00 7200**  
**GENERAL CONDITIONS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. **AIA Document A201 - General Conditions of the Contract for Construction** is incorporated by reference. Copies may be obtained from the Architect for the cost of reproduction.

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## SECTION 00 7300

### SUPPLEMENTARY GENERAL CONDITIONS

- A. The Supplementary Conditions herein described, contain changes and additions to Section 00 7000 - AIA Document A201, 2017 edition, General Conditions of the Contract for Construction. Where any part of the General Conditions is modified by these Supplementary Conditions, the unaltered provisions shall remain in effect.

#### ARTICLE 1 CONTRACT DOCUMENTS

**Add** the following:

"1.1.1.1 The Invitation to Bid and Bid Proposal Form shall be part of the Contract Documents."

**Add** the following:

"1.2.1.2 Where a conflict exists in the Contract Documents, the greater quantity, higher quality, or more restrictive requirement, as determined by the Architect, shall apply."

**Add** the following:

"1.5.3 Release of Electronic Media Drawing Files: An agreement titled "Agreement Concerning Drawing Files on Electronic Media" must be signed and returned to VCBO Architecture prior to release of any documents. A copy of the release is attached at Section 05 433.

#### ARTICLE 3 CONTRACTOR

**Delete** original paragraph 3.7.1 and substitute the following:

"3.7.1 The Contractor shall secure and the Owner shall pay for any permits, fees, and inspections required by work included in this Contract. All licensing shall be secured and paid for by Contractor."

**Add** the following:

"3.8.4 At close-out of Contract, funds remaining in the Contingency Allowance will be credited to the Owner by Change Order."

**Modify** the following:

3.10.1 **Delete** in the first sentence "... promptly..." and **substitute** "... within 24 hours..."

**Add** at the end of 3.10.1:

"This schedule shall be prepared in accordance with the requirements outlined in **Section 01 3300, Submittals** (1.3)."

**ARTICLE 5 SUBCONTRACTORS**

**Modify** the following:

5.2.1 **Delete** in the first sentence "... as soon as practicable..." and **substitute** "... within 24 hours..."

**Delete 5.2.4** and substitute the following:

"5.2.4 The Contractor shall not change a Subcontractor, person or entity previously selected without written notification and approval of the Owner and Architect."

**ARTICLE 7 CHANGES IN THE WORK**

**Add** the following:

"7.1.4 Subcontractors shall be limited to 10 percent mark-up for allowed profit and overhead on proposed changes and modifications. CM/GC shall be limited to 10 percent mark-up for allowed profit and overhead on proposed changes and modifications."

**ARTICLE 8 TIME**

**Add** the following:

**"8.4 Liquidated Damages**

- .1 The Contractor and Contractor's Surety shall be liable for and shall pay the Owner the sums hereinafter stipulated as liquidated damages of One Thousand Dollars per Day (\$1000.00) for each calendar day of delay beyond the scheduled completion date until Work is substantially complete and One Hundred Dollars per day (\$100.00) for each calendar day of delay for shop drawings/submittals received beyond 90 days after Notice of Award. Each trade shall complete their respective work within the General Contractor's construction schedule.
- .2 Should the Contractor fail to complete the work within the General Contractor's construction schedule included herein, or within such additional time as may have been allowed by extension, there shall be deducted from any moneys due or that may become due the Contractor the sum as stated in the Agreement. Such sum is fixed and agreed upon by the Owner and the Contractor as liquidated damages due the Owner by reason of the inconvenience and added costs of administration, engineering, and supervision resulting from the Contractor's default, and not as a penalty.
- .3 Permitting the Contractor to continue and finish the Work or any part of it after the time fixed for its completion, or after the date to which the time for completion may have been extended, shall in no way operate as a waiver on the part of the Owner of any of his rights under the agreement.
- .4 Protection of the top of masonry walls shall be provided as indicated in Division 4 Section "Unit Masonry Assemblies" or a liquidated damage amount of \$500.00 per calendar day shall be assessed for each day the top of masonry is not protected."

**ARTICLE 9 PAYMENTS AND COMPLETION**

**Add** the following:

"9.3.1.3 Payments made shall be 95 percent of scheduled values requested by each application for payment. Retainage shall be 5 percent and shall be retained until application for final payment is made at the completion of work. Amounts withheld as retainage will be held in an interest bearing account."

**ARTICLE 11 INSURANCE AND BONDS**

**Add** the following:

"11.1.1.1 Insurance limits are defined in "Invitation to Bid", prepared by the Contractor."

**Add** the following:

"11.1.1.2 The Owner and Architect shall be named as additional insured in the policies required by the Contract Documents."

**ARTICLE 12 UNCOVERING AND CORRECTION OF WORK**

**Add** the following;

"12.2.6 Special Project Warranty: Contractor shall warrant the Work of this Contract, in which Contractor agrees to repair or replace all assemblies and components that fail to remain weather-tight, including leaks, including but not limited to, all components of the membrane roofing system, flashings, rooftop mounted accessories or equipment, windows and glazing, doors and frames, storefronts and curtain walls, sealants, exterior wall coverings or claddings, for the following warranty period:  
1. Weather-tight Warranty Period: Three years from date of Substantial Completion."

**ARTICLE 13 MISCELLANEOUS PROVISIONS**

**Add** the following:

"13.6 INDEMNIFICATION

13.6.1 To the fullest extent permitted by law, Contractor shall indemnify, defend, and hold harmless Owner and Architect and their agents, affiliates, and employees from and against all claims, liabilities, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from the performance of the work, provided that any such claim, liability, damage, loss or expense (1) is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself) including the loss of use resulting therefrom (other than the Work itself or Owner's property), and (2) is caused by whole or in part by a negligent act or omission of Contractor, any Subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this Paragraph 4.18 or in Article 17 hereof.

13.6.2 In any and all claims against Owner or Architect or any of their agents or employees by any employee of Contractor, any Subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation under this Paragraph 4.18 shall not be limited in any way by an limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.”

**END OF SECTION**

**SECTION 05 1200**  
**STRUCTURAL STEEL**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Extent of structural steel work is shown on drawings, including schedules, notes and details to show size and location of members, typical connections, and type of steel required.
- B. Related Sections:
1. Section 05 3100 "Steel Decking" for field installation of shear connectors through deck.
  2. Section 05 5000 "Metal Fabrications" for miscellaneous steel fabrications and other metal items not defined as structural steel.
  3. Section 09 9100 "Painting" for surface preparation and priming requirements.
- C. **Definitions:**
1. Structural Steel: Elements of structural-steel frame, as classified by American Institute of Steel Construction (AISC) 303, "Code of Standard Practice for Steel Buildings and Bridges" and as otherwise shown on drawings.
  2. Seismic Resisting Elements: Elements of structural-steel frame designated as "SRE" or along grid lines designated as "SRE" on Drawings, including columns, beams, and their connections.
  3. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System and which are indicated as "Demand Critical" or "Seismic Critical" on Drawings.

**1.3 SUBMITTALS**

- A. Product Data: Submit producer's or manufacturer's specifications and installation instructions for each type of product, and not limited to the following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
1. High-strength bolts (each type), including nuts and washers.
  2. Structural steel primer paint.
  3. Shrinkage-resistant grout.
- B. Shop Drawings: Submit shop drawings, including complete details and schedules for fabrication and assembly of structural steel members, procedures and diagrams.
1. Include details of cuts, connections, camber, holes, and other pertinent data.
  2. Indicate welds by standard AWS A2.1 and A2.4 symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
  3. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of others sections.

4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts.
  5. Identify pretensioned and slip-critical, high-strength bolted connections.
  6. Indicate locations and dimensions of protected zones.
  7. Identify demand critical welds.
- C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint qualified by testing, including the following:
1. Power source (constant current or constant voltage).
  2. Electrode manufacturer and trade name, for demand critical welds.
- D. Test Reports: Submit copies of reports of tests conducted on shop and field bolted and welded connections. Include data on type(s) of tests conducted and test results.
- E. Surveys: Submit certified copies of each survey conducted by a registered professional engineer, showing elevations and locations of base plates and anchor bolts to receive structural steel, and final elevations and locations for major members. Indicate discrepancies between actual installation and Contract Documents.
- F. Informational Submittals:
1. Qualification Data: For Installer and fabricator.
  2. Welding certificates (maintained on jobsite).
  3. Mill test reports for structural steel, including chemical and physical properties.
  4. Product Test Reports: For the following:
    - a. Bolts, nuts, and washers including mechanical properties and chemical analysis.
    - b. Direct-tension indicators.
    - c. Tension-control, high-strength, bolt-nut-washer assemblies.
    - d. Shear stud connectors.
    - e. Shop primers.
    - f. Nonshrink grout.
    - g. Source quality-control reports
  6. Welding Certificates
    - a. Welder Performance Qualification Records (WPQR's)
    - b. Welding Procedure Specification (WPS) written in conformance with AWS D1.1 for each proposed type of welded joint, whether pre-qualified or qualified by testing.
  7. Manufacturer's Quality Assurance Plan
  8. Manufacturer's in-house Quality Assurance Inspection Report for each brace upon completion of fabrication.

#### 1.4 QUALITY ASSURANCE

- A. Source Quality Control: Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
1. Promptly remove and replace materials or fabricated components which do not comply.
- B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.
1. Fabricator must participate in the AISC Quality Certification Program and be designated an AISC-Certified Plant as follows:
    - a. Category: Category STD, standard steel building structures.



2. Fabricators without AISC Certification shall provide special inspectors and conduct special inspections as required by the General Structural Notes that are otherwise waived by AISC certification.
  3. Other Certifications, other than AISC, may be acceptable but must be submitted and approved by authorities having jurisdiction prior to fabrication of any steel.
- C. Design of Members and Connections: Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work.
- D. Promptly notify Architect whenever design of members and connections for any portion of structure are not clearly indicated.
- E. Codes and Standards:
1. Comply with provisions of following, except as otherwise indicated:
    - a. AISC 303 - 2010 "Code of Standard Practice for Steel Buildings and Bridges", excluding the following: Section 1.5.2, Section 3.3 (last sentence of paragraph), Section 4.4, Section 4.4.1, Section 4.4.2, Section 4.5, Section 7.5.4, and Section 7.11.5, and Section 7.13.3.
  2. AISC 360 - 2016 "Specification for Structural Steel Buildings", including "Commentary" and Supplements thereto as issued.
  3. AISC 341 - 2016 "Seismic Provisions of Structural Steel Buildings"
  4. AISC/RCSC 2009 "Specification for Structural Joints using ASTM A325 or A490 Bolts" prepared by the Research Council on Structural Connections.
  5. American Welding Society (AWS) D1.1 - 2010 "Structural Welding Code - Steel".
  6. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use".
- F. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".
1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests within the last 12 months.
  2. If recertification of welders is required, retesting will be Contractor's responsibility.

## 1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to site at such intervals to ensure uninterrupted progress of work.
1. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not to delay work.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.
1. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.
- C. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
  2. Clean and relubricate bolts and nuts that become dry or rusty before use.
  3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

## 1.6 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 75 percent.
- B. Metal Surfaces, General: For fabrication of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.
- C. Wide Flange Structural Steel Shapes: ASTM A 992, Grade 50.
  - 1. Other Structural Steel Shapes, Plates and Bars: ASTM A 36 or ASTM A572 Gr. 50 as indicated.
- D. Hollow Structural Sections (HSS): ASTM A 500, Grade C.
- E. Hot-Formed Steel Tubing: ASTM A 501.
  - 1. Steel Pipe: ASTM A 53, Type E or S, Grade B; or ASTM A 501.
    - a. Finish: Black, except where indicated to be galvanized.
- G. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- H. Anchor Rods: ASTM F1554 Grade36, unless otherwise indicated.
- I. Unfinished Threaded Rods: ASTM A 36, Grade A, regular low-carbon steel bolts and nuts.
  - 1. Provide washers ASTM F436 Type 1 and provide hexagonal heads and nuts ASTM A563 Heavy-Hex carbon steel for all connections.
- J. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:
  - 1. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A 325.
  - 2. Direct tension indicator washers may be used at Contractor's option.
- K. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, and ASTM F 2280 heavy-hex head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
- L.

- N. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.
- O. Electrodes for Welding: Comply with AWS requirements.
- P. Structural Steel Primer Paint: Comply with Section 09 9100 Painting
  - 1. Basis of Design Product: Tnemec Series 90-97 Tneme-Zinc
    - 1. Generic Type: Aromatic Urethane, Zinc-Rich
      - a. Solids by Volume: 63%
      - b. Zinc Dust Content: 83% by weight in dried film
      - c. Volatile Organic Compounds, Unthinned: 2.68 lbs./gallon (321 grams/liter)
      - d. Curing Time at 75°F (24°C)
        - 1) Handle: 1 hour
        - 2) To Recoat: 4 hours (For faster curing and low-temperature applications, add Series 44-710 Urethane Accelerator.)
      - e. Salt Spray (Fog)
        - 1) Method: ASTM B 117
        - 2) System: One coat aromatic urethane zinc-rich applied to SSPC-SP10/NACE 2 Near-White Metal Blast Cleaned steel and cured 14 days at 75°F (24°C).
        - 3) Requirement: No blistering, cracking, rusting or delamination of film. No more than 1/8-inch rust creepage at scribe after 50,000 hours exposure.
- Q. Cement Grout: Portland cement (ASTM C 150, Type I or Type III) and clean, uniformly graded, natural sand (ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum water required for placement and hydration.
- R. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

## 2.3 FABRICATION

- A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
  - 1. Camber structural-steel members where indicated.
  - 2. Fabricate beams with rolling camber up.
  - 3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
  - 4. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
  - 5. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
  - 6. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
    - a. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
  - 7. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
  - 8. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

9. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
  10. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3, "Power Tool Cleaning."
  11. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
  12. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
    - a. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
    - b. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
    - c. Weld threaded nuts to framing and other specialty items indicated to receive other work.
- B. Connections: Weld or bolt shop connections, as indicated.
1. Bolt field connections, except where welded connections or other connections are indicated.
    - a. Joint Type: Snug tightened unless indicated otherwise on Drawings.
  2. Provide high-strength threaded fasteners for principal bolted connections, except where unfinished bolts are indicated.
  3. Provide unfinished threaded fasteners for only bolted connections of secondary framing members to primary members (including purlins, girts, and other framing members taking only nominal stresses) and for temporary bracing to facilitate erection.
- C. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC/RCSC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts".
- D. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.
1. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
  2. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.
  3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
    - a. Grind butt welds flush.
    - b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.
  4. Minimum weld sizes, unless detailed otherwise:
    - a. Weld pipe columns to base plates and top plates with 1/4 inch 6 mm fillet weld all around.
- E. **Shear Connectors:** Prepare steel surfaces as recommended by manufacturer of shear connectors. Where possible shop weld shear connectors, spaced as shown, to beams and girders in composite construction. Use automatic end welding of headed stud shear connectors in accordance with manufacturer's printed instructions. Under no circumstances shall fastening of shear studs be permitted in wet or moist conditions.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Surveys: Employ a registered professional engineer or land surveyor for accurate erection of structural steel. Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Architect. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been agreed upon with Architect.

### **3.2 ERECTION**

- A. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds. Do not shore cambered steel beams unless otherwise indicated on drawings.
  - 1. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.
  - 2. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.
- B. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
  - 1. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
- C. Adjustments: Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout. Install high strength washers under nuts at all anchor bolts.
- D. Grouting: Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
  - 1. Comply with manufacturer's instructions.
- E. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  - 1. Level and plumb individual members of structure within specified AISC tolerances.
  - 2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.
  - 3. Splice members only where indicated and accepted on shop drawings.
- F. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces.
- G. Field Adjustments: Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

1. Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.
- H. Thermal Cutting: Do not use thermal cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members which are not under stress, as acceptable to Architect. Finish gas-cut sections equal to a sheared appearance when permitted. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.
- I. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop primer. Apply paint to exposed areas using same material as used for shop painting.
  1. Apply by brush or spray to provide dry film thickness of 1.5 mils.

### 3.3 QUALITY CONTROL

- A. Testing Agency: Owner will employ and pay a qualified independent testing agency to perform field quality-control testing services specified in this section.
- B. Testing agency shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.
- C. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.
- D. Testing agency may inspect structural steel at plant before shipment; however, Architect reserves right, at any time before final acceptance, to reject material not complying with specified requirements.
- E. Correct deficiencies in structural steel work which inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as may be necessary to reconfirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.
- F. Shop Bolted Connections: Inspect or test in accordance with AISC specifications.
- G. Shop Welding: Inspect and test during fabrication of structural steel assemblies, as follows:
  1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
  2. Perform visual inspection of all welds.
  3. Perform tests of welds as follows. Inspection procedures listed are to be used at Contractor's option.
    - a. Liquid Penetrant Inspection: ASTM E 165.
    - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
    - c. Ultrasonic Inspection: ASTM E 164.
    - d. Radiographic Inspection: ASTM E 94.
  4. Inspection of shop welding is not required if the fabricator complies with applicable sections of the 2018 IBC.

- H. Field Bolted Connections: Inspect in accordance with applicable sections of 2018 IBC per AISC 360 "Specification for Structural Steel Buildings".
- I. Field Welding: Inspect and test during erection of structural steel as follows:
  - 1. Comply with applicable sections of 2018 IBC.
  - 2. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
  - 3. Perform visual inspection of all welds.
- J. In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
  - 1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
  - 2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.
- K. Prepare test and inspection reports.

### **3.4 CLEANUP**

- A. Refer to Division 1, Section "Execution".

**END OF SECTION**

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November 16, 2023

VCBO Project No. 22785

ADDENDUM #1  
FOOD SERVICE EQUIPMENT

**OSD HILLCREST ELEMENTARY SCHOOL REPLACEMENT**

FS-ADD#1-1:

The following revisions are to be made to the Food Service Equipment Specification Section 114000 Change:

**3.5 INSTRUCTIONS AND TRAINING:**

- A. Training for the refrigeration systems and equipment shall be for a minimum of (2) District personnel for a minimum of 2 days. Training shall be provided at the refrigeration equipment manufacturer. Airfare, lodging and meals shall be at the expense of the manufacturer.**
  
- B. Instruct the District personnel and any and all representatives of the District group in the proper operation and maintenance of each piece of operational equipment. This will be provided on site after the facility has been certified.**

Change:  
ITEM #K-27

HOT HOLDING/PROOFING CABINET

Quantity: (1) each

Manufacturer: Winston

Model Number: #HOV5-14UV HA4519

Dimensions: 25"W x 34"D x 76"H

Utility Requirements: A) 120/60/1, 19.1 amp.

Accessories: A) Set of heavy-duty locking casters.

B) Viewing windows.

C) Dutch doors.

D) Hinged on right as per plan.

Installation Instructions: A) Set in place as per plan.

B) Cord & Plug utility connection to be to Utility Distribution System, item #K-34.

FS-ADD#1-2:

Change:

FS102: Area 12 Food Service Equipment Custom Equipment Details:

- A. Section Detail 13, 14, 15 & 16 to call out 3 CM stone top as per architects selection.

End Food Service Equipment Addendum #1

Please refer all questions to:

Ric Jedrziwski

Jedrziwski Designs

**OSD HILLCREST ES****Electrical Addendum #1****Issue Date:11/16/2023****GENERAL CLARIFICATIONS:****PHOTOVOLTAIC SYSTEM**

**BASE BID:** Provide conduit only for future PV gear. Provide the required conduit pathways with pull strings as indicated below. Refer to one-line for conduit sizes. If alternate #1 is not accepted, do not provide the Photovoltaic System, and do not provide the specified Power Conditioning System per construction documents.

- **'CT/MS' TO RMP PV DISCONNECT**
- **RMP PV DISCONNECT TO 'DPPV'**
- **'DPPV' TO INVERTERS #1 AND #2**

**ALTERNATE #1:** Provide the complete specified PV system and Power Conditioning System per the construction documents.

**CHANGES TO THE SPECIFICATIONS:****SPECIFICATION 27 4100:**

Page 9 MULTIPURPOSE ROOM EQUIPMENT SCHEDULE (1 of 2)

1. Change 'R3' to 'R1'

| <b>MULTIPURPOSE ROOM EQUIPMENT SCHEDULE (1 OF 2)</b> |   |                        |                           |
|--|---|------------------------|---------------------------|
| <b>TYPE</b>  | <b>DESCRIPTION</b>  | <b>MANFR.</b>          | <b>MODEL NO.</b>          |
| <i>R1</i>  | <i>EQUIPMENT RACK, FLOOR SWING-OUT 91" TALL, 28" DEEP, 40 RU WITH VENTED FRONT DOOR</i> | <i>MIDDLE ATLANTIC</i> | <i>SR-40-28 W/LVFD-40</i> |
| <b>END OF SCHEDULE</b>                               |   |                        |                           |

**CHANGES TO THE DRAWINGS:****SHEET E001**

1. Telephone/Data Legend:
  - a. Revise AV IP intercom speaker. Refer to Z-ID callouts on TA300 series for individual IP zone callouts.
  - b. Revise Classroom Sound Amplification. Refer to TA1##.2 series sheets for CSA locations

**OSD HILLCREST ES****Electrical Addendum #1****Issue Date:11/16/2023**

## SHEET E002

1. Fixture Schedule:
  - a. Revise HB1 to 4000k CCT
  - b. Fixture OL removed from the project.
  - c. Fixture L2RM: revise description and part number to reflect fixture being recessed into t-grid.
  - d. Fixture L8MGO: remove drywall flange kit. Fixture recessed into t-grid.
  - e. TL1, TL2, and TR: Provide black finishes of the stage and white finishes in the multi-purpose room
  - f. LA5R/LA7R: Fixture to be surface mount. Coordinate with architectural ceiling system. Revise lens to a .5" lens drop.

## SHEET E003

1. Equipment Schedule
  - a. Revise MAU-2 to MAU-1.
  - b. Revise pumps P-3 and P-4 to 9B. VFD's furnished and installed by others, connected by div. 26
  - c. Revise CP-1 to 4A for manual starter with thermal overload.
  - d. Revise EUH-1 to 2B for a disconnection furnished and installed by others, connected by div. 26

## SHEET E101

1. Refer to the attached sheet for changes.

## SHEET E104

1. Refer to the attached sheet for changes.

## SHEET E105

1. Refer to the attached sheet for changes.

## SHEET E111.1

1. Work Room 1112: Revise (1) A65 to emergency and circuit to 2EMH1-3
2. Wellness Room 1113: Revise wall switch to a RC1 type. Provide a room controller with designation '1E', provide a ceiling mounted occupancy sensor.
3. Elevator Equip. 1116: provide (1) line voltage switch adjacent to the door.
4. Remove line voltage switch shown in chase space between toilets 1114/1115.
5. Nurse 1108: Emergency fixture circuited to 2EMH1-3
6. Assistant Principal 1106 and Records 1107: Revise wall switch to a RC1 type. Provide a room controller with designation '1E', provide a ceiling mounted occupancy sensor
7. Locate 7.5' long display case cabinet light 'DC' with a local override line voltage switch at new display case of the main corridor outside nurse 1108. Circuit to 1HC1-25, relay 1RPC1-10 of the DC fixtures in Steam Lab 1336.
8. Quite 1110: Remove wall-mounted occupancy switch within the room. Provide a 2-Hour Timer switch on the corridor side just on the outside of the Quite Room to control the on/off function of the light fixture with the Quite Room. Label switch cover "QUITE ROOM".

**OSD HILLCREST ES****Electrical Addendum #1****Issue Date:11/16/2023**

## SHEET E111.2

1. Community Room 1123: revise east wall duplexes to GFCI and locate devices above counter.
2. Community room 1122: locate west wall devices above counter.
3. Main Corridor 1101: Delete floating two data symbols near display and vestibule.
4. Provide duplex at new display case in main corridor outside nurse 1108. Circuit to 1LA2-3.

## SHEET E111.3

1. Toilet 1109: remove wall mounted strobe and keep ceiling mounted strobe.
2. Remove the credential card reader on door 1102B, and revise the interior door type from type C to type K.
3. Added Sheet Keynote Y13 for the door release buttons, duress buttons, and the school lockdown buttons.
4. Updated and Added access control door hardware, credential card reader, and door position switch to door 1118C, Type A.
5. Updated the access control type on door number 1118A, to Type B.

## SHEET E112.1

1. Platform: circuit exterior OWDO fixture outside the platform to 2EMH1-25, relay 2RPC1-5.
2. Multipurpose: remove line voltage switch shown adjacent to the northeast set of double doors.
3. Mechanical 1206: South Exit Doors, OWDO fixture to be mounted at 12'.
4. Platform remove keynote L13
5. TR track above stage to be black, TR track within multipurpose room to be white.

## SHEET E112.2

1. Multi-purpose 1200: Provide power and a single data drop for scoreboard. Circuit scoreboard to 1LB2-24. The scoreboard will be located on the West wall of the multi-purpose room. Refer to architectural drawings and elevation for exact location.
2. Outdoor Storage 1209: Locate an additional pushbutton/keyed switch for motorized overhead door on the exterior.
3. Circuit (2) shown basketball standards to 1LB2-24 and 26.
4. Locate (4) additional basketball standards: (3) in the western side (north wall, center, and south wall) and (1) in the eastern side (center). Circuit to 1LB2-28, 30, 32, and 34. Provide keyed switches within switching cabinets.
5. Locate keyed switches within both switching cabinets for each of the (6) motorized basketball standards.

## SHEET E112.3

1. Locker Room 1219: Remove CO detector
2. Receiving 1222: add note Y7 and control and monitor module to CO detector.
3. Outdoor Storage: Wall-mounted fire alarm horn strobe located on outside wall. Coordinate with fire protection for the exact location. Wire the fire bell completely and tie into the fire alarm system.
4. Remove the credential card reader and electrified door hardware on door 1400E
5. On door 1207B add a door position switch/contact.
6. On door 1201, removed the access control door hardware on this door.

**OSD HILLCREST ES****Electrical Addendum #1****Issue Date:11/16/2023**

## SHEET E113.1

1. Steam Storage 1334: Provide a line voltage switch for manual override.
2. Revise Site Tech Office 1331 SL2C fixture to A55.

## SHEET E113.2

1. Site Tech Office: Revise west and south duplexes to circuit 1LC1-6.
2. General Classrooms: Revise exterior wall so (1) outlet shown above counter top is relocated to 18" and centered on the bench panels. Revise relocated outlet to a USB A+C duplex. Change applies to each classroom in this area (8 instances).

## SHEET E113.3

1. Steam Lab 1336: Revise interior door from type C to type K
2. Elec 1333: Locate an additional smoke detector within the space.
3. Steam Lab 1336B East Door: Updated/Changed the interior access control type from type C to type K.
4. On door 1326A added door position contacts to the double doors, type L.
5. On door 1335A added door position contacts to the double doors, type L.

## SHEET E114.1

1. Storage 1416, 1413, 1402, 1406: Provide emergency relay callouts '1E' for emergency switching
2. Storage 1406: revise switches to type RC1.
3. Girls 1425, boys 1423: provide a (2) power packs located above accessible ceiling of the corridor to the east of the restrooms. Locate (1) additional L4MD in Girls 1425 and circuit (4) L4MD fixtures at the entrance to corridor emergency relay/ckt 2EMH2-5, 2RPD1-1.
4. Steam Lab 1426: provide (1) daylight sensor.

## SHEET E114.2

1. General Classrooms: Revise exterior wall so (1) outlet shown above countertop is relocated to 18" and centered on the bench panels. Revise relocated outlet to a USB A+C duplex. Change applies to each classroom in this area, (8 instances).

## SHEET E114.3

1. Steam Lab 1426B East Door: Updated/Changed the interior access control type from type C to type K.
2. Steam Lab West Door: Updated to show the correct door number (from 1531 to 1426).
3. Elec 1421: provide a smoke detector.
4. Refer to attached sheet.
5. On door 1419A added door position contacts to the double doors, type L.

## SHEET E121.1

1. Group Room 2108 and Behavioral Specialist 2111: Revise (1) A65 fixture in each room to emergency and circuit to 2EMH1-11. Revise room controller callout to '1E'.
2. Counseling Group 2110: Revise room controller callout to '1E'.
3. Corridor 2104: locate an additional occupancy sensor within the corridor.

**OSD HILLCREST ES****Electrical Addendum #1****Issue Date:11/16/2023**

4. Quite 2112: Provide L4HD fixture instead of 2x4 fixture. The ceiling will be gypsum instead of ACT. Remove the wall-mounted occupancy switch within the room. Provide a 2-Hour Timer switch on the corridor side just on the outside of the Quite Room to control the on/off function of the light fixture with the Quite Room. Label switch cover "QUITE ROOM".

## SHEET E121.2

1. Mechanical 1922:
  - a. Revise Trap Primer to a GFCI outlet
  - b. Air Handler Unit VFD located on the AHU. Refer to mechanical diagram for location.

## SHEET E121.3

1. Added Door 2104 that will have access controlled electrified door hardware, credential card reader, type C.

## SHEET E122.1

1. Mechanical 2200:
  - a. Revise line voltage switch to a 3 way switch.

## SHEET E122.2

1. Mechanical 2200:
  - a. Revise Trap Primer to a GFCI outlet

## SHEET E122.3

1. Mechanical 2200:
  - a. Provide intrusion contacts on roof hatch and exterior Door.
2. Corridor 2101: Provide an additional wall mount smoke detector within skylight with note Y1

## SHEET E123.1

1. Storage 2313, 2316, 2306, 2302: Provide emergency relay callouts '1E' for emergency switching

## SHEET E123.2

1. General Classrooms: Revise exterior wall so (1) outlet shown above counter top is relocated to 18" and centered on the bench panels. Revise relocated outlet to a USB A+C duplex. Change applies to each classroom in this area (8 instances).

## SHEET E123.3

1. Mechanical 2320:
  - a. Provide intrusion contacts on roof hatch.
  - b. Credential card readers and electrified door hardware added on doors 2301A, 2303A, 2305A, and 2307A.

## SHEET E124.1

1. Storage 2413, 2416, 2406, 2402: Provide emergency relay callouts '1E' for emergency switching

## SHEET E124.2

**OSD HILLCREST ES****Electrical Addendum #1****Issue Date:11/16/2023**

1. General Classrooms: Revise exterior wall so (1) outlet shown above countertop is relocated to 18" and centered on the bench panels. Revise relocated outlet to a USB A+C duplex. Change applies to each classroom in this area (8 instances).

## SHEET E124.3

1. Mechanical 2420:
  - a. Provide intrusion contacts on roof hatch.

## SHEET E201.2

1. Keynote P21: revise typical power plan callout to E201.2

## SHEET E203

1. Mechanical 2200:
  - a. Air Handler Unit VFD located on the AHU. Refer to mechanical diagram for location.
2. Mechanical 2320:
  - a. Air Handler Unit VFD located on the AHU. Refer to mechanical diagram for location.
  - b. Revise Trap Primer to a GFCI outlet
3. Mechanical 2420:
  - a. Air Handler Unit VFD located on the AHU. Refer to mechanical diagram for location.
  - b. Revise Trap Primer to a GFCI outlet
4. Mechanical 1206:
  - a. Add WP callout to GFCI duplex outside door.

## SHEET E205

1. Revise Kitchen Equipment Schedule note 12 as follows: all 120V and 208V 1P receptacles 50A and below shall be GFCI protected via either GFCI outlet or GFCI breaker. All 208V 3P receptacles 100A and below shall be GFCI protected via either GFCI outlet or GFCI breaker.
2. Revise K31C to a direct connection.

## SHEET E206

1. Refer to the attached sheet for changes.

## SHEET E312

1. Panelboard K2: Revise K-44 on circuits 3 and 14 to GFCI breakers.

## SHEET E403

1. Delete Sheet Entirely.

## SHEET TA002

1. Change R1 Dimensions to 40RU, Height 90.8" Width 23.5", Depth 28"

**PRIOR APPROVAL OF MANUFACTURERS OF ELECTRICAL EQUIPMENT**

The following items, trade names, products, and manufacturers are approved for bidding. Approval does not relieve the bidder from satisfying the intent of the requirements of drawings, specifications, and addenda in every respect. Failure to conform to the design quality and standards specified, established and required

## OSD HILLCREST ES

### Electrical Addendum #1

Issue Date:11/16/2023

may result in later disapproval. If equipment must be disapproved after bidding, the supplier shall supply specified equipment at no extra cost to the Owner.

Items are listed generally and specific model number, etc. shall be as submitted. Items submitted but not approved, either did not satisfy the requirements, or showed insufficient data, or arrived after the 8-day deadline established for submittals.

| <u>TYPE</u> | <u>SPECIFIED</u>  | <u>QUANTOM APPROVED</u> | <u>SSCO APPROVED</u> | <u>B26 APPROVED</u>     | <u>JRC APPROVED</u> |
|-------------|-------------------|-------------------------|----------------------|-------------------------|---------------------|
| A55         | LITHONIA          | METALUX                 | DAY-BRITE            | COLUMBIA                | -                   |
| A65         | LITHONIA          | METALUX                 | DAY-BRITE            | COLUMBIA                | -                   |
| A75         | LITHONIA          | METALUX                 | DAY-BRITE            | COLUMBIA                | -                   |
| B34         | LITHONIA          | METALUX                 | DAY-BRITE            | COLUMBIA                | -                   |
| B44         | LITHONIA          | METALUX                 | DAY-BRITE            | COLUMBIA                | -                   |
| D4A         | CONTECH           | PORTFOLIO               | LIGHTOLIER           | -                       | GOTHAM              |
| D4GL        | ALPHABET LIGHTING | -                       | LIGHTOLIER           | LIGHT HEADED            | ZANIBONI            |
| DC          | Q-TRAN            | -                       | OMNILIGHT            | PRECISELED              | KELVIX              |
| EH          | COLUMBIA LIGHTING | METALUX                 | DAY-BRITE            | COLUMBIA                | LITHONIA            |
| EZT24       | ARON LIGHTING     | -                       | KLUS                 | XICO                    | ALUZ                |
| EZT25       | ARON LIGHTING     | -                       | KLUS                 | XICO                    | ALUZ                |
| EZT44       | ARON LIGHTING     | -                       | KLUS                 | XICO                    | ALUZ                |
| EZT45       | ARON LIGHTING     | -                       | KLUS                 | XICO                    | ALUZ                |
| G           | KENALL LIGHTING   | -                       | NEWSTAR              | PARAMOUNT               | LUMINAIRE           |
| HB1         | GE LIGHTING       | METALUX                 | -                    | ILP                     | LITHONIA            |
| K4          | DAY-BRITE         | METALUX                 | DAY-BRITE            | ILP                     | LITHONIA            |
| L2RM        | PINNACLE          | NULITE                  | -                    | LUMENWERX               | ALW                 |
| L4HD        | METALUX           | -                       | H.E. WILLIAMS        | COLUMBIA                | LITHONIA            |
| L4HDO       | METALUX           | -                       | H.E. WILLIAMS        | COLUMBIA                | LITHONIA            |
| L4HPO       | LUMENWERX         | NULITE                  | AXIS LIGHTING        | -                       | ALW                 |
| L4MD        | METALUX           | -                       | H.E. WILLIAMS        | COLUMBIA                | LITHONIA            |
| L8MD        | METALUX           | -                       | H.E. WILLIAMS        | COLUMBIA                | LITHONIA            |
| L8MDO       | METALUX           | -                       | H.E. WILLIAMS        | COLUMBIA                | LITHONIA            |
| L8MGO       | METALUX           | -                       | H.E. WILLIAMS        | COLUMBIA                | LITHONIA            |
| LA5R        | NEO-RAY           | -                       | AXIS LIGHTING        | LUMENWERX .5" DROP LENS | LUX ILLUMINAIRE     |
| LA7R        | NEO-RAY           | -                       | AXIS LIGHTING        | LUMENWERX .5" DROP LENS | LUX ILLUMINAIRE     |
| LSC1        | SONNEMAN          | LGU                     | LGU                  | LGU                     | LGU                 |
| LSC2        | SONNEMAN          | LGU                     | LGU                  | LGU                     | LGU                 |



## OSD HILLCREST ES

### Electrical Addendum #1

Issue Date: 11/16/2023

|      |                             |                       |               |                            |          |
|------|-----------------------------|-----------------------|---------------|----------------------------|----------|
| LSC3 | SONNEMAN                    | LGU                   | LGU           | LGU                        | LGU      |
| OW1P | H.E. WILLIAMS               | LUMARK                | -             | BEACON                     | LITHONIA |
| OWDO | CASEY ARCHITECTURAL         | EVERGREEN             | COLE LIGHTING | TMS                        | LGU      |
| OWSD | CASEY ARCHITECTURAL         | EVERGREEN             | COLE LIGHTING | TMS                        | LGU      |
| OWUD | CASEY ARCHITECTURAL         | EVERGREEN             | COLE LIGHTING | TMS                        | LGU      |
| P2M  | LITHONIA/GENERAL STRUCTURES | McGRAW-EDISON +KW     | VISIONAIRE    | BEACON VIPER               | -        |
| P2S  | LITHONIA/GENERAL STRUCTURES | McGRAW-EDISON +KW     | VISIONAIRE    | BEACON VIPER               | -        |
| P4M  | LITHONIA/GENERAL STRUCTURES | McGRAW-EDISON +KW     | VISIONAIRE    | BEACON VIPER               | -        |
| P4S  | LITHONIA/GENERAL STRUCTURES | McGRAW-EDISON +KW     | VISIONAIRE    | BEACON VIPER               | -        |
| P24M | LITHONIA/GENERAL STRUCTURES | McGRAW-EDISON +KW     | VISIONAIRE    | BEACON VIPER               | -        |
| SL2C | METALUX                     | -                     | DAYBRITE      | COLUMBIA                   | LITHONIA |
| TL1  | INTENSE LIGHTING            | TIMES SQUARE LIGHTING | -             | CONTECH                    | JUNO     |
| TL2  | INTENSE LIGHTING            | TIMES SQUARE LIGHTING | -             | CONTECH                    | JUNO     |
| TR   | INTENSE LIGHTING            | TIMES SQUARE LIGHTING | -             | CONTECH                    | JUNO     |
| X1   | EMERGI-LITE                 | -                     | MULE LIGHTING | BEGHELLI/CURRENT UNIVERSAL | ISOLITE  |
| X2   | EMERGI-LITE                 | -                     | MULE LIGHTING | BEGHELLI/CURRENT UNIVERSAL | ISOLITE  |

### Section 28 2205 Access Control System

1. Add Ideacom to the list of Pre-approved, RBH Certified installers

### Section 28 3111 Fire Alarm and Detection System

2. Add Powered Control Systems to the list of Pre-approved installers



**Nelson Powers**  
 Director of Operations  
 Powered Control Systems  
 (801) 576 6634 (801) 916-6710  
 nelson@poweredcontrolsystems.com  
 https://poweredcontrolsystems.com  
 770 E 9000 S Suite B Sandy UT 84094

a.

**END OF ELECTRICAL ADDENDUM**

**Hillcrest Elementary School - BP5  
Ogden School District**

**MECHANICAL ADDENDUM NO. 01**

**November 16, 2023**

**Revisions to the Specifications:**

| <i>Item:</i> | <i>Section #:</i>   | <i>Description:</i>   |
|--------------|---------------------|---|
| 1.1          | 210000-6.3.6.A      | Water Supply Analysis: <ul style="list-style-type: none"><li>• CMGC will provide an allowance in the bid for the building fire protection systems, as the water supply analysis was not available at the time of bid.</li></ul>   |
| 1.2          | Section 22000-8.2.9 | Add the following:<br>2.9.E: Thermostats at Quiet Rooms shall be sensors behind the ceiling return air grille.<br><br>2.9.F: Thermostats serving exterior vestibules shall have heating and cooling limits set per 2021 IECC requirements. <ol style="list-style-type: none"><li>1. Heating not greater than 60 degrees F.</li><li>2. Cooling not less than 85 degrees F.</li></ol> |

**Approved Manufacturers Products:**

The following manufacturers, tradenames, and products are approved with the provision that they shall completely satisfy all and every requirement of the Drawings, Specifications, and all Addenda, and shall conform to the design, quality, and standards specified, established, and required for the complete and satisfactory installation and performance of the building and all its respective parts.

| <u>PRODUCT</u>                 | <u>MANUFACTURER</u> |
|--------------------------------|---------------------|
| Louvers                        | Air Rite, Pottorff  |
| Sound Traps                    | Price               |
| Domestic Water Heaters         | State, Laars, PVI   |
| Domestic Water Expansion Tanks | Elbi                |
| Mixing Valves                  | Acorn               |
| Emergency Eyewash              | Guardian, Acorn     |
| Water Closets                  | Sloan               |
| Urinals                        | Sloan               |
| Lavatories                     | Sloan               |
| Trench Drains                  | Watts               |
| Roof Drains                    | Josam               |
| Downspout Nozzles              | Josam               |

### **Revisions to the Drawings:**

| <i>Item:</i> | <i>Sheet #:</i> | <i>Description:</i>   |   |
|--------------|-----------------|---|---|
| 1.1          | M111            | Quiet Room 1110:  | Locate temperature sensor in return air grille located in ceiling.                          |
| 1.2          | M112            | Multi-Purpose 1200:   | Delete (2) G-5 grilles.   |
| 1.3          | M113            | STEAM Lab 1336  | Clarification at laser engraver ventilation duct.   |
| 1.4          | M114            | Storage Room 1402:<br>Storage Room 1413:                              | Move thermostat to south side of west door.<br>Move thermostat to south side of east door.  |
| 1.5          | M221            | Quiet 2112  | Add VAV Box RB-1.<br>Temperature sensor to be behind RA grille.<br>Added transfer air duct. |
| 1.6          | M223            | Storage Room 2316:<br>Storage Room 2306:                              | Transfer air duct to be 12"x 6".<br>Transfer air duct to be 12"x 6".                        |
| 1.7          | MP221           | Sheet re-issued for clarity of notes.<br>Added VAV box at Quiet 2112. |   |
| 1.8          | M403            | Kitchen 1213: Sheet re-issued with revised exhaust duct sizes.        |   |
| 1.9          | P221            | Quiet Room 2112: Add floor drain FD-1.                                |   |
| 1.10         | P407            | Quiet Room 1110: Add floor drain FD-1.                                |   |
| 1.11         | P501            | Plumbing Equipment Schedule revised.                                  |   |

### Attachments:

- Sheet M111
- Sheet M112
- Sheet M113
- Sheet M114
- Sheet M221
- Sheet M223
- Sheet MP221
- Sheet M403
- Sheet P221
- Sheet P407
- Sheet P501

End of Mechanical Addendum #01

**OSD HILLCREST ELEMENTARY REPLACEMENT**  
**BID PACKAGE 5 – GENERAL CONSTRUCTION - ADDENDUM 01**

16 November 2023 - VCBO Project No. 22785

**OVERALL TABLE OF CONTENTS (Page 3 of Project Manual)**

- A. **Delete** original page 3 (ToC page 1) from the Project Manual and **substitute** revised page, issued herewith.
- B. **Change** Division 27 section 27 1500 name **from** “Audiovisual Systems” **to** “Telephone/Data Systems”

**SECTION 00 6276.14 FORM TC-721G EXEMPTION CERTIFICATE FOR GOVERNMENTS AND SCHOOLS**

- A. **Delete** original form from Project Manual and substitute revised form, issued herewith.

**SECTION 00 7200 GENERAL CONDITIONS OF THE CONTRACT**

- A. **Delete** this section from the Project Manual. Delete references in Tables of Contents.

**SECTION 00 7300 SUPPLEMENTARY GENERAL CONDITIONS**

- A. **Delete** this section from the Project Manual. Delete references in Tables of Contents.

**SECTION 05 4000 COLD-FORMED METAL FRAMING**

- A. Delete original section from Project Manual and substitute revised section, issued herewith.

**SECTION 07 4243 COMPOSITE METAL WALL PANELS**

- A. Delete original section from Project Manual and substitute revised section, issued herewith.

**SECTION 08 7100 DOOR HARDWARE**

- A. Delete original section from Project Manual and substitute revised section, issued herewith.

## **SECTION 09 0000 FINISH SCHEDULE**

- A. **Delete** this section from the Project Manual. Delete references in Tables of Contents.

## **SECTION 10 1200 DISPLAY CASES**

- A. **Add** this section, issued herewith, to the Project Manual. Add section name and number to overall Table of Contents and to the Division 10 Table of Contents.

## **SECTION 11 6623.23 VOLLEYBALL EQUIPMENT**

- A. **Add** this section, issued herewith, to the Project Manual. Add section name and number to overall Table of Contents and to the Division 11 Table of Contents.

## **SECTION 11 6643 INTERIOR SCOREBOARDS**

- A. **Add** this section, issued herewith, to the Project Manual. Add section name and number to overall Table of Contents and to the Division 11 Table of Contents.

## **DIVISION 27 TABLE OF CONTENTS**

- A. **Change** Division 27 section 27 1500 name **from** "Audiovisual Systems" **to** "Telephone/Data Systems"

**END OF BP 5 - ADDENDUM 01 LANGUAGE**

## **DIVISION 01 – GENERAL REQUIREMENTS**

|                 |  |
|-----------------|--|
| Section 01 1000 | Summary of Work                        |
| Section 01 1900 | Definitions and Standards              |
| Section 01 2600 | Contract Modification Procedures       |
| Section 01 2300 | Alternates                             |
| Section 01 2600 | Contract Modification Procedures       |
| Section 01 2900 | Payment Procedures                     |
| Section 01 3100 | Project Management and<br>Coordination |
| Section 01 3300 | Submittal Procedures                   |
| Section 01 4000 | Quality Requirements                   |
| Section 01 6000 | Product Requirements                   |
| Section 01 7300 | Execution                              |
| Section 01 7700 | Closeout Procedures                    |
| Section 01 7823 | Operation and Maintenance Data         |
| Section 01 7900 | Demonstration and Training             |

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Utah State Tax Commission

# Exemption Certificate for Governments & Schools

(Sales, Use, Tourism and Motor Vehicle Rental Tax)

**TC-721G**

Rev. 6/11

|  |                     |                  |          |
|--|---------------------|------------------|----------|
| Name of institution claiming exemption (purchaser) |                     | Telephone Number |          |
| Street Address                                     | City                | State            | ZIP Code |
| Authorized Signature<br><i>[Signature]</i>         | Name (please print) | Title            |          |
| Name of Seller or Supplier:                        |                     | Date             |          |

The person signing this certificate **MUST** check the applicable box showing the basis for which the exemption is being claimed. Questions should be directed (preferably in writing) to Taxpayer Services, Utah State Tax Commission, 210 N 1950 W, Salt Lake City, UT 84134. Telephone 801-297-2200, or toll free 1-800-662-4335.

**DO NOT SEND THIS CERTIFICATE TO THE TAX COMMISSION**  
Keep it with your records in case of an audit.

**UNITED STATES GOVERNMENT OR NATIVE AMERICAN TRIBE**  
I certify the tangible personal property or services purchased are to be paid directly with funds from the entity noted on this form and will be used in the exercise of essential governmental or tribal functions. NOTE: Includes sales of tangible personal property to federally chartered credit unions. "Directly" does not include per diem, entity advances, or government reimbursements for employee credit card purchases.

**CONSTRUCTION MATERIALS PURCHASED FOR SCHOOLS OR PUBLIC TRANSIT DISTRICTS**  
I certify the construction materials purchased are on behalf of a public elementary or secondary school, or public transit district. I further certify the purchased construction materials will be installed or converted into real property owned by the school or public transit district.  
Name of school or public transit district: \_\_\_\_\_  
Name of project: \_\_\_\_\_

**UTAH STATE AND LOCAL GOVERNMENTS AND PUBLIC ELEMENTARY AND SECONDARY SCHOOLS**  
Sales Tax License No. \_\_\_\_\_  
I certify the tangible personal property or services purchased are to be paid directly with funds from the entity noted on this form and will be used in the exercise of that entity's essential functions. For construction materials, if the purchaser is a Utah state or local government, these construction materials will be installed or converted into real property by employees of this government entity. "Directly" does not include per diem, entity advances, or government reimbursements for employee credit card purchases. **CAUTION:** This exemption does not apply to government or educational entities of other states.

**HEBER VALLEY HISTORIC RAILROAD**  
I certify these purchases and sales are by the Heber Valley Historic Railroad Authority or its operators and are related to the operation and maintenance of the Heber Valley Historic Railroad.

**FOREIGN DIPLOMAT**  
I certify that lodging-related purchases are authorized by a diplomatic tax exemption card issued by the United States.

To be valid this certificate must be filled in completely, including a check mark in the proper box.

**A sales tax license number is required only where indicated.**

Please sign, date and, if applicable, include your license or exemption number.

**NOTE TO SELLER:** Keep this certificate on file since it must be available for audit review.

**NOTE TO PURCHASER:** Keep a copy of this certificate for your records. You must notify the seller of cancellation, modification, or limitation of the exemption you have claimed.

If you need an accommodation under the Americans with Disabilities Act, contact the Tax Commission at (801) 297-3811 or TDD (801) 297-2020. Please allow three working days for a response.



**SECTION 01 1000**  
**SUMMARY OF WORK**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Requirements of Division 00 "Procurement and Contracting Requirements" and Division 01 "General Requirements" apply to every section contained in the Project Manual, and shall govern the execution of Work required by the Contract Documents.
- B. Provide everything necessary for and incidental to proper and satisfactory completion of all Work specified and indicated or shown in the Contract Documents.
- C. The Project consists of the construction of a new Elementary School to replace Hillcrest Elementary for the Ogden School District.

**1.2 PROJECT LOCATION**

- A. Site for the new Elementary School is located at 130 North Eccles Ave., Ogden, Utah.

**1.3 PHASING OF WORK AND SEPARATE CONTRACTS**

- A. Project is being issued in multiple bid packages.
  - 1. Demolition Bid Package (Issued 15 May 2023): Demolition of the existing elementary school and the site work per the delineation line on the Site Drawings.
  - 2. Bid Package 2 (Issued 10 August 2023): Footings and Foundations: Underground utilities and foundation work and concrete.
  - 3. Bid Package 3 (Issued 11 September 2023): Structural Steel
  - 4. Bid Package 4 (Issued 15 September 2023): Electrical Switchgear
  - 5. Bid Package 5 (Issued herewith): General Construction.
  - 3. Bidding for phases shall be separated & clearly identified in the bid submission.
- B. The Owner may enter into separate contracts for construction. Each contractor shall be responsible to coordinate efforts with other trade contractors to ensure timely completion of the work.
- C. Coordinate the Work of this contract with the work of separate contractors to ensure timely completion of the work.

**1.4 CODES**

- A. Law of place of building governs. Conform to applicable requirements of the latest editions of the International Building Code, International Building Code Standards, International Mechanical Code, International Plumbing Code, National Electrical Code, National Fire Protection Association requirements, local ordinances, and UOSHA requirements applicable to this project, unless a higher standard is called for, without additional cost to the Owner.
- B. Comply with CABO/ANSI A117.1, American National Standard, "Accessible and Usable Buildings and Facilities" latest edition which is in force for the project location, for handicapped accessibility.

## 1.5 CONTRACTOR USE OF PREMISES

- A. General: During the construction period the Contractor shall have use of the premises for construction operations, including:
1. The Contractor's use of the premises is limited only by the Owner's right to perform work or to retain other contractors on portions of the Project.
- B. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.
1. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the Owner and Owner's employees and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
  2. Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials and location of storage sheds to the areas indicated. If additional storage is necessary obtain and pay for such storage off-site.
  3. Lock automotive type vehicles such as passenger cars and trucks and other types of mechanized and motorized construction equipment, when parked and unattended, so as to prevent unauthorized use. Do not leave such vehicles or equipment unattended with the motor running or the ignition key in place.
  4. Limits: Limit site disturbance, including earthwork and clearing of vegetation, to 40 feet beyond building perimeter; 10 feet beyond surface walkways, patios, surface parking, and utilities less than 12 inches in diameter; 15 feet beyond primary roadway curbs and main utility branch trenches; and 25 feet beyond constructed areas with permeable surfaces (such as pervious paving areas, stormwater detention facilities, and playing fields) that require additional staging areas in order to limit compaction in the constructed area.

## 1.6 INCIDENTAL WORK

- A. Any work, materials or equipment that **may reasonably be inferred** from the **Contract Documents** as being required to produce the intended result shall be supplied by the Contractor at no additional cost to the owner whether or not specifically called for in the Contract Documents.

## PART 2 - PRODUCTS (NOT USED)

## PART 3 - EXECUTION (NOT USED)

END OF SECTION

## SECTION 01 1900

### DEFINITIONS AND STANDARDS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Definitions: Basic Contract definitions are included in the General Conditions.
1. Directed: Terms such as "directed", "requested", "authorized", "selected", "approved", "required", and "permitted" mean "directed by the Architect", "requested by the Architect", and similar phrases. However, no implied meaning shall be interpreted to extend the Architect's responsibility into the Contractor's area of construction supervision.
  2. Approve: The term "approved," where used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the duties and responsibilities of the Architect as stated in General and Supplementary Conditions. Such approval shall not release the Contractor from responsibility to fulfill Contract requirements unless otherwise provided in the Contract Documents.
  3. Furnish: The term "furnish" is used to mean "supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations."
  4. Install: The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations."
  5. Provide: The term "provide" means "to furnish and install, complete and ready for the intended use."
- B. Specification Format and Conventions:
1. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's "MasterFormat" numbering system.
    - a. Section Identification: The Specifications use section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.
  2. Specification Content: The Specifications use certain conventions for style of language and the intended meaning of terms, words, and phrases when used in particular situations. These conventions are as follows.
    - a. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
    - b. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
      - 1) The words "shall", "shall be", or "shall comply with", depending on the context, are implied where a colon (:) is used within a sentence or phrase.

- C. Drawing Symbols:
1. Graphic symbols: Where not otherwise noted, symbols are defined by "Architectural Graphic Standards", published by John Wiley & Sons, Inc., latest edition.
    - a. Mechanical/Electrical Drawings: Graphic symbols used on mechanical and electrical Drawings are generally aligned with symbols recommended by ASHRAE. Where appropriate, they are supplemented by more specific symbols recommended by technical associations including ASME, ASPE, IEEE, and similar organizations. Refer instances of uncertainty to the Architect for clarification before proceeding.
- D. Industry Standards:
1. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents. Such standards are made a part of the Contract Documents by reference. Individual Sections indicate which codes and standards the Contractor must keep available at the Project Site for reference.
  2. Publication Dates: Where the date of issue of a referenced standard is not specified, comply with the standard in effect as of date of Contract Documents.
  3. Conflicting Requirements: Where compliance with two or more standards is specified, and they establish different or conflicting requirements for minimum quantities or quality levels, the most stringent requirement will be enforced, unless the Contract Documents indicate otherwise. Refer requirements that are different, but apparently equal, and uncertainties as to which quality level is more stringent to the Architect for a decision before proceeding.
  4. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.
    - a. Where copies of standards are needed for performance of a required construction activity, the Contractor shall obtain copies directly from the publication source.
    - b. Although copies of standards needed for enforcement of requirements also may, be included as part of required submittals, the Architect reserves the right to require the Contractor to submit additional copies as necessary for enforcement of requirements.
- E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision.

**END OF SECTION**

## SECTION 01 2300

### ALTERNATES

#### PART 1- GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for alternates.

##### 1.3 DEFINITIONS

- A. **Alternate:** An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
- B. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

##### 1.4 PROCEDURES

- A. **Coordination:** Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
- B. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- C. **Notification:** Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- D. **Execution of Work:** Execute accepted alternates under the same conditions as other work of the Contract.
- E. **Schedule:** A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

#### PART 2 - PRODUCTS (NOT USED)

## **PART 3 - EXECUTION**

### **3.1 SCHEDULE OF ALTERNATES**

#### **A. Alternate No. 1 - Photovoltaic Collectors**

1. Base Bid: Provisions for future photovoltaic collector system including the on-line monitoring system, the electrical distribution system and branch circuit conduits for approximately twelve (12) future inverters stubbed to the roof and capped for future installation at locations to be determined by the electrical engineer. Base bid shall also include provisions in roofing warranty to allow installation of system without voiding or affecting Owner's warranty rights.
2. Alternate: Provide the cost for the rooftop photovoltaic system as indicated on the Drawings and as specified in Section 26 3100, "Turnkey Rooftop Photovoltaic Collectors". The cost shall also include the slip sheets at roofing.

**END OF SECTION**

## SECTION 01 2600

### CONTRACT MODIFICATION PROCEDURES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections include the following:
  - 1. Section 01 6000 "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

##### 1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

##### 1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - 1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
  - 2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    - c. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to the Architect.
1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
  2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
  3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
  4. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
  5. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.
- C. Proposal Request Form: Use AIA Document G709 for Proposal Requests.

## **1.5 CHANGE ORDER PROCEDURES**

- A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

## **1.6 CONSTRUCTION CHANGE DIRECTIVE**

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

## **PART 2 - PRODUCTS (NOT USED)**

## **PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**



## SECTION 01 2900

### PAYMENT PROCEDURES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections include the following:
  - 1. Section 01 2600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.

##### 1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

##### 1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
  - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
    - 2. Application for Payment forms with Continuation Sheets.
    - 3. Submittals Schedule.
    - 4. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
  - 5. Sub-schedules: Where the Work is separated into phases requiring separately phased payments, provide sub-schedules showing values correlated with each phase of payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
  - 1. Identification: Include the following Project identification on the Schedule of Values:
    - a. Project name and location.
    - b. Name of Architect.
    - c. Architect's project number.
    - d. Contractor's name and address.
    - e. Date of submittal.

2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
  - a. Related Specification Section or Division.
  - b. Description of the Work.
  - c. Name of subcontractor.
  - d. Name of manufacturer or fabricator.
  - e. Name of supplier.
  - f. Change Orders (numbers) that affect value.
  - g. Dollar value.
    - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
  - a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing if required.
6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
  - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
8. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

## **1.5 APPLICATIONS FOR PAYMENT**

- A. General: Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
  1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.

- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
  2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
1. Submit partial waivers on each item for amount requested, before deduction for retainage, on each item.
  2. When an application shows completion of an item, submit final or full waivers.
  3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  4. Waiver Delays: Submit each Application for Payment with Contractor's waiver of mechanic's lien for construction period covered by the application.
    - a. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
  5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
  2. Schedule of Values.
  3. Contractor's Construction Schedule (preliminary if not final).
  4. Products list.
  5. Schedule of unit prices.
  6. Submittals Schedule (preliminary if not final).
  7. List of Contractor's staff assignments.
  8. List of Contractor's principal consultants.
  9. Copies of building permits.
  10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
  11. Initial progress report.
  12. Report of preconstruction conference.
  13. Certificates of insurance and insurance policies.
  14. Performance and payment bonds.
  15. Data needed to acquire Owner's insurance.
  16. Initial settlement survey and damage report if required.

- H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
  2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
  2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  3. Updated final statement, accounting for final changes to the Contract Sum.
  4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
  5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
  6. AIA Document G707, "Consent of Surety to Final Payment."
  7. Evidence that claims have been settled.
  8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
  9. Final, liquidated damages settlement statement.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 01 3100

### PROJECT MANAGEMENT AND COORDINATION

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. General project coordination procedures.
  - 2. Conservation.
  - 3. Coordination Drawings.
  - 4. Administrative and supervisory personnel.
  - 5. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 01 7300 "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
  - 2. Section 01 3300 "Submittals" for procedures for coordinating electronic submittals.
  - 3. Section 01 7700 "Closeout Procedures" for coordinating Contract closeout.

##### 1.3 COORDINATION

- A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Memoranda: If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
  - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's Construction Schedule.
  2. Preparation of the Schedule of Values.
  3. Installation and removal of temporary facilities and controls.
  4. Delivery and processing of submittals.
  5. Progress meetings.
  6. Preinstallation conferences.
  7. Project closeout activities.
- D. Administrative Software Requirements: The General Contractor shall submit all project related information (i.e. Submittals, RFI's, ASI's, Addenda, Construction documents, Project logs, Field reports, and Meeting minutes) using the Architect's File Transfer Site. Architect will provide access information to the General Contractor at the pre-construction meeting or as appropriate to the schedule of the project.
1. The General Contractor shall employ a PDF review software system such as Blue Beam ([www.bluebeam.com](http://www.bluebeam.com)) or another similar system for producing, formatting, and marking-up project related documents. The General Contractor shall review all the documents and add their stamp and comments directly to the PDF prior to posting for the Design team to review.
  2. General Contractor shall provide to the Architect and Owner, an electronic archive of all data at the end of the project via DVD(s) for final project records.
- E. Contractor is to keep a printed record of all Construction Documents including all clarifications, RFI's and approved changes to the Contract on site.
- F. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work.

#### **1.4 SUBMITTALS**

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
1. Indicate relationship of components shown on separate Shop Drawings.
  2. Indicate required installation sequences.
  3. Refer to Division 23 Section "Basic Mechanical Materials and Methods" and Division 26 Section "Basic Electrical Materials and Methods" for specific Coordination Drawing requirements for mechanical and electrical installations.
- B. Staff Names: Within 5 business days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone.

- C. Submittal Log: See section 'Submittal Procedures' for electronic delivery and record keeping.

## 1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
  - 1. Include special personnel required for coordination of operations with other contractors.
  - 2. The General Contractor shall have a superintendent on the project whenever Sub-contractors are working on the project.

## 1.6 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
  - 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
  - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
  - 3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within 3 days of the meeting.
  
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
  - 1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  - 2. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Tentative construction schedule.
    - b. Phasing.
    - c. Critical work sequencing.
    - d. Designation of responsible personnel.
    - e. Procedures for processing field decisions and Change Orders.
    - f. Procedures for processing Applications for Payment.
    - g. Distribution of the Contract Documents.
    - h. Submittal procedures including access information to the Architect's File Transfer Site.
    - i. Preparation of Record Documents.
    - j. Use of the premises.
    - k. Responsibility for temporary facilities and controls.
    - l. Parking availability.
    - m. Office, work, and storage areas.
    - n. Equipment deliveries and priorities.
    - o. First aid.
    - p. Security.
    - q. Progress cleaning.
    - r. Working hours.

3. Documentation: Furnish Architect certificate of insurance naming VCBO as an additional insured.
- C. Progress Meetings: Conduct progress meetings at weekly intervals. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Status of submittals.
      - 4) Deliveries.
      - 5) Off-site fabrication.
      - 6) Access.
      - 7) Site utilization.
      - 8) Temporary facilities and controls.
      - 9) Work hours.
      - 10) Hazards and risks.
      - 11) Progress cleaning.
      - 12) Quality and work standards.
      - 13) Change Orders.
      - 14) Documentation of information for payment requests.
  3. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
    - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

## 1.7 REQUESTS FOR INFORMATION (RFI)

- A. Procedure: Immediately on discovery of the need for interpretation of Contract Document, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
1. Request shall originate with General Contractor. RFI's submitted by entities other than General Contractor will be returned with no response.
  2. Coordinate and submit RFI's in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.



- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
1. Project name.
  2. Date.
  3. Name of Contractor.
  4. Name of Architect and Owner.
  5. RFI number, numbered sequentially.
  6. Specification Section number and title and related paragraphs, as appropriate.
  7. Drawing number and detail references, as appropriate.
  8. Field dimensions and conditions, as appropriate.
  9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contractor Time or the Contract Sum, Contractor shall state impact in the RFI.
  10. Contractor's signature.
  11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
    - a. Supplementary drawings prepared by Contractor shall include dimensions, thickness, structural grid references, and details of affected materials, assemblies, and attachments.
- C. Hard-Copy RFI's: Use the form supplied by the Architect or the Owner.
1. Identify each page of attachments with the RFI number and sequential page number.
  2. Attachments shall be electronic files in Adobe Acrobat PDF format.
- D. Electronic RFI's:
1. RFI's shall be processed and delivered electronically through Architect's File Transfer Site with sequential numbers.
- E. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow seven working days for Architect's response for each RFI. RFI's received after 1:00 p.m. will be considered as received the following working day.
1. The following RFI's will be returned without action:
    - a. Requests for approval of submittals.
    - b. Request for approval of substitutions.
    - c. Requests for coordination information already indicated in the Contract Documents.
    - d. Request for adjustments in the Contract Time or Contract Sum.
    - e. Requests for interpretation of Architect's actions on submittals.
    - f. Incomplete RFI's or RFI with numerous errors.
  2. Architect's action may include a request for additional information, in which case Architect's Time for response will start again.
  3. Architect's action on RFI that may result a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
    - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Owner in writing within 10 calendar days of receipt of the RFI response.
- F. On receipt of Architect's and Owner's action, update the RFI log and immediately distribute the RFI response to the affected parties. Review response and notify Architect and Owner within seven calendar days if Contractor disagrees with response.

- G. RFI Log: Prepare, maintain, and submit a tabular log of RFI's organized by RFI number. Submit log monthly.
1. Project name.
  2. Name and address of Contractor.
  3. Name and address of Architect and Owner.
  4. RFI number including RFI's that were dropped and not submitted.
  5. RFI description.
  6. Date the RFI was submitted.
  7. Date Architect's and Owner's response was received.
  8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
  9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 01 3300

### SUBMITTAL PROCEDURES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for submittals required for performance of the Work, including:
  - 1. Contractor's construction schedule.
  - 2. Daily construction reports.
  - 3. Shop Drawings.
  - 4. Product Data.
  - 5. Samples.
  - 6. Deferred Submittals for review by the Building Code Official.
- B. Administrative Submittals: Refer to other Division-1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:
  - 1. Applications for payment.
  - 2. Performance and payment bonds.
  - 3. Insurance certificates.
  - 4. List of Subcontractors.
- C. Inspection and test reports are included in Division 1 Section "Quality Control Services."
- D. Related Documents:
  - 1. Section 01 3100 "Project Management and Coordination": Electronic web-based construction administration software.

##### 1.3 ELECTRONIC SUBMITTAL DELIVERY

- A. To minimize printing reimbursables, shipping reimbursables and the impact on the environment, submittals shall be processed and delivered electronically.
  - 1. A single hard copy shall also be furnished, if requested by the Architect.
- B. The Construction Manager or Contractor must first review and approve all submittals sent by Subcontractors prior to sending to design team. Include Contractor's certification that information complies with Contract Document requirements, record deviations from Contract Document requirements, including minor variations and limitations. Submittals uploaded by subcontractors shall not be visible to the Design team until the submittal becomes official and is forwarded from the Construction Manager or Contractor to the Design team with a transmittal.

- C. Submittals must follow the requirements outlined in this specification and as required in individual specification sections.
- D. Deliver the following types of submittals to the design team electronically in pdf format:
  - 1. Product Data
  - 2. Shop Drawings
  - 3. Certifications
  - 4. Test Data
  - 5. Schedules
  - 6. Calculations
  - 7. Mix Designs
  - 8. Warranty Information
- E. Samples and Color Selection
  - 1. All samples/color selections shall be delivered by mail or courier to the design team for review.
  - 2. Samples and color selection shall not be reviewed electronically.
  - 3. See separate specification sections for quantities and sample selection process. The design team shall return review comments via the Architect's File Transfer Site.
- F. Submittal Stamps
  - 1. The Contractor or Construction Manager shall affix an electronic stamp to PDF submittals.
- G. Submittal Logs
  - 1. Design team shall maintain a submittal log through the Architect's internal electronic filing system.
  - 2. Construction team shall make a reasonable effort to deliver all submittals electronically.
  - 4. Samples shall be delivered hardcopy by mail

#### **1.4 SUBMITTAL PROCEDURES**

- A. No submittal will be accepted by the Architect without the General Contractor's action stamp, clearly visible, indicating that the submittal has been fully reviewed by the General Contractor for compliance to the Construction Documents.
- B. Submittals with the General Contractor's stamp but not in compliance with the Construction Documents will be deemed incomplete and returned without review. These will not be shown as received.
- C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
  - 1. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
    - a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

- D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal.
1. Initial Review: Allow 15 business days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
  2. Concurrent Review: Where concurrent review of submittals by Architect's consultants, Owner, or other parties is required, allow 20 business days for initial review of each submittal.
  3. Deferred Submittal Review: Where deferred submittals are required by the Building Code Official allow review time as dictated by the Official.
  4. If intermediate submittal is necessary, process it in same manner as initial submittal.
  5. Allow 15 business days for processing each resubmittal.
  6. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.
- E. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
1. Include the following information on the label for processing and recording action taken.
    - a. Project name.
    - b. Date.
    - c. Name and address of Architect.
    - d. Name and address of Contractor.
    - e. Name and address of Subcontractor.
    - f. Name and address of Supplier.
    - g. Name of Manufacturer.
- F. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Architect using a transmittal form. Submittals received from sources other than the Contractor will be returned without action.
1. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.
- G. Submittal requirements for electronic PDF submittals:
1. All submittals shall be created with native PDF files whenever possible. Do not print a PDF file, and scan in as an image file, as this will delete all file search functions typically embedded within a native PDF file.
  2. All PDF submittals shall be broken down by individual specification section. Do not collate multiple specification sections together into one non-separated submittal package (i.e. carpet, VCT, rubber base, and entry mats; though frequently provided by one installer, shall not be submitted as one non-separated package unless formatted as described below.)
  3. All PDF submittals that cover multiple items within one specification section, or PDF submittals that include multiple related specification sections shall have an index and be formatted with electronic book marks to distinguish various components from one another, and make each item easily retrievable without navigating through each page of an entire submittal.

## 1.5 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Prepare a fully developed, horizontal bar-chart type Contractor's construction schedule.
1. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated in the "Schedule of Values".
  2. Within each time bar indicate estimated completion percentage in 10 percent increments. As Work progresses, place a contrasting mark in each bar to indicate Actual Completion.
  3. Prepare the schedule on a sheet of sufficient width to show data for the entire construction period.
  4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the Work.
  5. Coordinate the Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests and other schedules.
  6. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Architect's procedures necessary for certification of Substantial Completion.
- B. Distribution: Following response to the initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.
1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
- C. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

## 1.6 DAILY CONSTRUCTION REPORTS

- A. Daily Construction Report: Prepare a daily construction report, recording the following information concerning events at the site; and submit duplicate copies to the Architect at weekly intervals:
1. List of subcontractors at the site.
  2. Approximate count of personnel at the site.
  3. High and low temperatures, general weather conditions.
  4. Accidents and unusual events.
  5. Meetings and significant decisions.
  6. Stoppages, delays, shortages, losses.
  7. Meter readings and similar recordings.
  8. Orders and requests of governing authorities.
  9. Change Orders received, implemented.
  10. Services connected, disconnected.

- B. Material Location Reports: At monthly intervals, prepare a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.
- C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information on CSI Form 13.2A. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

## **1.7 SPECIAL REPORTS**

- A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

## **1.8 SHOP DRAWINGS**

- A. Submit in timely manner to complete project, but no later than 90 days after Notice of Award.
  - 1. A fee of \$100.00 will be charged by the Owner, per submittal for all submittals past this date.
- B. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings.
- C. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:
  - 1. Dimensions.
  - 2. Identification of products and materials included.
  - 3. Compliance with specified standards.
  - 4. Notation of coordination requirements.
  - 5. Notation of dimensions established by field measurement.
- D. Sheet Size: Submit Shop Drawings, layout drawings and other Revit or CADD style sheets formatted for 24 x 36 inch or 30 x 42 inch sheets. Details and drawings are to match or exceed construction bid document scales. All drawings are to be submitted to scale. All other product brochures and cut sheets can be provided in an 8-1/2 x 11 format.
- E. Final Electronic Submittal: Submit 2 prints, one for the Architect and one for the Owner at the end of the project or as requested by the parties during construction.
  - 1. If submittal was reviewed by members of the design team other than the Architect, provide an additional copy of the submittal for each design firm.
  - 2. The prints shall be marked-up and maintained as a "Record Document".

- F. Final Submittal: Submit 5 prints. 2 prints will be retained; the remainder will be returned.
  - 1. One of the prints returned shall be marked-up and maintained as a "Record Document".
  - 2. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

## **1.9 DEFERRED SUBMITTALS**

- A. Certain building elements are specified to be designed under the direction of the supplier or subcontractors. See the General Information sheet on the drawings for a list of required deferred submittals.
- B. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- C. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and one paper copy of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
  - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.
- D. Submit deferred submittals on same size sheet as original drawings (30 x 42 or 8 1/2 x 11). Drawings and calculations shall be on the Design Professional's title block stating the project name and all other items specified under 'Submittal Preparation' above.
- E. Submit deferred submittals to the Architect who will disperse copies to the Building Code Official for review as required by the IBC.
- F. Contractor shall include these submittal sheets in the Record Documents.

## **1.10 PRODUCT DATA**

- A. Submit in timely manner to complete project, but no later than 90 days after Notice of Award.



- B. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings."
  - 1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:
    - a. Manufacturer's printed recommendations.
    - b. Compliance with recognized trade association standards.
    - c. Compliance with recognized testing agency standards.
    - d. Application of testing agency labels and seals.
    - e. Notation of dimensions verified by field measurement.
- C. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
- D. Submittals: Submit one hard copy and one electronic copy of each required submittal; submit additional copies where required for maintenance manuals. The Architect will retain one, and will return the other marked with action taken and corrections or modifications required.
- E. Electronic Submittals: Submit a pdf copy and a hard copy of each required submittal; include copies where required for maintenance manuals. See electronic submittal delivery and submittal procedures for further requirements

#### **1.11 SAMPLES**

- A. Submit in timely manner to complete project, but no later than 90 days after Notice of Award.
- B. Samples: Submit full-size, fully fabricated samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture and pattern.
- C. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit 3 sets; one will be returned marked with the action taken.
  - 1. Maintain sets of samples and a file of product submittals, as returned, at the Project site, for quality comparisons and product verification throughout the course of construction.

#### **1.12 CONTRACTOR'S REVIEW**

- A. Contractor's Review: Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
- C. Submittals not marked with an approval stamp and those not in compliance with the Construction Documents shall be returned without further review. It is the Contractor's responsibility to review submittals for compliance prior to forwarding the submittal to the Design Team for review.

### **1.13 ARCHITECT'S ACTION**

- A. Architect's Action: Except for submittals for record, information or similar purposes, where action and return is required or requested, the Architect will review each submittal, mark to indicate action taken, and return promptly.
  - 1. Compliance with specified characteristics is the Contractor's responsibility.
- B. Action Stamp: The Architect will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked to indicate the action taken.
  - 1. Corrections or comments made on the shop drawings during this review do not relieve the Contractor from compliance with requirements of the drawings and specifications. This check is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The Contractor is responsible for; confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner.

### **PART 2 - PRODUCTS (NOT USED)**

### **PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 01 4000

### QUALITY REQUIREMENTS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for quality control services.
- B. Quality control services include inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor. They do not include Contract enforcement activities performed by the Architect.
- C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.
  - 1. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities.
  - 2. Inspections, test and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.
- D. Requirements for the Contractor to provide quality control services required by the Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

##### 1.3 RESPONSIBILITIES

- A. Contractor Responsibilities:
  - 1. Unless otherwise indicated as the responsibility of another identified entity, Contractor shall provide inspections, tests, and other quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction. Costs for these services shall be included in the Contract Sum.
    - a. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Contractor's responsibility, the Contractor shall employ and pay a qualified independent testing agency to perform quality-control services. Costs for these services are included in the Contract Sum.
    - b. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Owner's responsibility, the Owner will employ and pay a qualified independent testing agency to perform those services.
  - 2. Retesting: The Contractor is responsible for retesting where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.

3. Cost of Retesting: Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction.
  4. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:
    - a. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.
    - b. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.
    - c. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.
    - d. Security and protection of samples and test equipment at the Project site.
- B. Owner Responsibilities: The Owner will provide inspections, tests and similar quality control services specified to be performed by independent agencies and not by the Contractor, except where they are specifically indicated as the Contractor's responsibility or are provided by another identified entity. Costs for these services are not included in the Contract Sum.
1. The Owner will employ and pay for the services of an independent agency, testing laboratory or other qualified firm to perform services which are the Owner's responsibility.
- C. Duties of the Testing Agency: The independent testing agency engaged to perform inspections, sampling and testing of materials and construction specified in individual Specification Sections shall cooperate with the Architect and Contractor in performance of its duties, and shall provide qualified personnel to perform required inspections and tests.
1. The agency shall notify the Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  2. The agency is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents, or approve or accept any portion of the Work.
  3. The agency shall not perform any duties of the Contractor.
- D. Coordination: The Contractor and each agency engaged to perform inspections, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
1. The Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

#### **1.4 SUBMITTALS**

- A. The independent testing agency shall submit a certified written report of each inspection, test or similar service, to the Architect, in duplicate
1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.

2. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to:
  - a. Date of issue.
  - b. Project title and number.
  - c. Name, address and telephone number of testing agency.
  - d. Dates and locations of samples and tests or inspections.
  - e. Names of individuals making the inspection or test.
  - f. Designation of the Work and test method.
  - g. Identification of product and Specification Section.
  - h. Complete inspection or test data.
  - i. Test results and an interpretations of test results.
  - j. Ambient conditions at the time of sample-taking and testing.
  - k. Name and signature of laboratory inspector.
  - l. Recommendations on retesting.

## **1.5 QUALITY ASSURANCE**

- A. Qualification for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, which are prequalified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.
  1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the State in which the Project is located.

## **PART 2 - PRODUCTS (NOT USED)**

## **PART 3 - EXECUTION**

### **3.1 TESTS REQUIRED**

- A. Tests required may include but not be limited to the following (all items listed here may not occur, see Drawings and associated section of the Specifications):
  1. Soil compaction.
  2. Concrete.
  3. Welding.
  4. High strength bolts.
  5. Structural masonry.
- B. It is recommended that the Contractor arrange for soils compaction and any other soils-related testing to be performed by or through the same firm that provided the initial soils investigation data. A copy of the soils investigation data is included with the project manual or if not included may be obtained from the Architect's Office upon request. The soils investigation is included for reference only.

### **3.2 REPAIR AND PROTECTION**

- A. General: Upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes.
1. Protect construction exposed by or for quality control service activities, and protect repaired construction.
  2. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

**END OF SECTION**

## SECTION 01 5000

### TEMPORARY FACILITIES AND CONTROLS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.
- B. Temporary utilities include, but are not limited to, the following:
  - 1. Sewers and drainage.
  - 2. Water service and distribution.
  - 3. Sanitary facilities, including toilets, wash facilities, and drinking-water facilities.
  - 4. Heating and cooling facilities.
  - 5. Ventilation.
  - 6. Electric power service.
  - 7. Lighting.
  - 8. Telephone service.
  - 9. Internet service/WiFi.
- C. Support facilities include, but are not limited to, the following:
  - 1. Temporary roads and paving.
  - 2. Dewatering facilities and drains.
  - 3. Project identification and temporary signs.
  - 4. Waste disposal facilities.
  - 5. Field offices.
  - 6. Storage and fabrication sheds.
  - 7. Lifts and hoists.
  - 8. Temporary elevator usage.
  - 9. Temporary stairs.
  - 10. Construction aids and miscellaneous services and facilities.
  - 11. First aid station.
- D. Security and protection facilities include, but are not limited to, the following:
  - 1. Environmental protection.
  - 2. Stormwater control.
  - 3. Tree and plant protection.
  - 4. Pest control.
  - 5. Site enclosure fence.
  - 6. Security enclosure and lockup.
  - 7. Barricades, warning signs, and lights.
  - 8. Covered walkways.
  - 9. Temporary enclosures.
  - 10. Temporary partitions.
  - 11. Fire protection.

- E. Related Sections include the following:
  - 1. Section 13 3000 "Submittals" for procedures for submitting copies of implementation and termination schedule and utility reports.
  - 2. Section 01 7300 "Execution Requirements" for progress cleaning requirements.
  - 3. Divisions 2 through 48 for temporary heat, ventilation, and humidity requirements for products in those Sections.

### **1.3 DEFINITIONS**

- A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weather-tight; exterior walls are insulated and weather-tight; and all openings are closed with permanent construction or substantial temporary closures.

### **1.4 USE CHARGES**

- A. General: Cost or use charges for temporary facilities are not chargeable to Owner or Architect and shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:
  - 1. Owner's construction forces.
  - 2. Occupants of Project.
  - 3. Architect.
  - 4. Testing agencies.
  - 5. Personnel of authorities having jurisdiction.
- B. Sewer Service: Pay sewer service use charges for sewer usage, by all parties engaged in construction, at Project site.
- C. Water Service: Pay water service use charges, whether metered or otherwise, for water used by all entities engaged in construction activities at Project site.
- D. Electric Power Service: Pay electric power service use charges, whether metered or otherwise, for electricity used by all entities engaged in construction activities at Project site.

### **1.5 QUALITY ASSURANCE**

- A. Standards: Comply with ANSI A10.6, NECA's "Temporary Electrical Facilities," and NFPA 241.
  - 1. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.
  - 2. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

### **1.6 PROJECT CONDITIONS**

- A. Temporary Utilities: At earliest feasible time, when acceptable to Owner, change over from use of temporary service to use of permanent service.
  - 1. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each



permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

- B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:
  - 1. Keep temporary services and facilities clean and neat.
  - 2. Relocate temporary services and facilities as required by progress of the Work.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect. Provide materials suitable for use intended.
- B. Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top rails.
- C. Lumber and Plywood: Comply with requirements in Division 6 Section "Miscellaneous Carpentry."
- D. Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less.
- E. Water: Potable.

### **2.2 EQUIPMENT**

- A. General: Provide equipment suitable for use intended.
- B. Field Offices: Prefabricated or mobile units with lockable entrances, operable windows, and serviceable finishes; heated and air conditioned; on foundations adequate for normal loading.
- C. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.
  - 1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.
- D. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.
- E. Drinking-Water Fixtures: Containerized, tap-dispenser, bottled-water drinking-water units, including paper cup supply.
  - 1. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 degrees F.

- F. Heating Equipment: Unless Owner authorizes use of permanent heating system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
  - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
  - 2. Heating Units: Listed and labeled, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use for type of fuel being consumed.
- G. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.
- H. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION, GENERAL**

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.
- B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

### **3.2 TEMPORARY UTILITY INSTALLATION**

- A. General: Engage appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.
  - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
  - 2. Provide adequate capacity at each stage of construction. Before temporary utility is available, provide trucked-in services.
  - 3. Obtain easements to bring temporary utilities to Project site where Owner's easements cannot be used for that purpose.
- B. Sewers and Drainage: Provide temporary connections to remove effluent that can be discharged lawfully.
  - 1. Filter out excessive soil, construction debris, chemicals, oils, and similar contaminants that might clog sewers or pollute waterways before discharge.
  - 2. Connect temporary sewers to municipal system as directed by sewer department officials.
  - 3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. After heavy use, restore normal conditions promptly.
  - 4. Provide temporary filter beds, settlement tanks, separators, and similar devices to purify effluent to levels acceptable to authorities having jurisdiction.

- C. **Water Service:** Install water service and distribution piping in sizes and pressures adequate for construction until permanent water service is in use. Sterilize temporary water piping before use.
1. Provide rubber hoses as necessary to serve Project site.
  2. As soon as water is required at each level, extend service to form a temporary water- and fire-protection standpipe. Provide distribution piping. Space outlets so water can be reached with a 100-foot hose. Provide one hose at each outlet.
  3. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.
- D. **Sanitary Facilities:** Provide temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.
1. **Disposable Supplies:** Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
  2. **Toilets:** Install self-contained toilet units. Shield toilets to ensure privacy. Provide separate facilities for male and female personnel.
  3. **Drinking-Water Facilities:** Provide bottled-water, drinking-water units.
    - a. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 degrees F.
- E. **Heating and Cooling:** Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed.
1. Maintain a minimum temperature of 50 degrees F in permanently enclosed portions of building for normal construction activities, and 65 degrees F for finishing activities and areas where finished Work has been installed.
- F. **Ventilation and Humidity Control:** Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- G. **Electric Power Service:** Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnecting means, automatic ground-fault interrupters, and main distribution switchgear.
1. Install power distribution wiring overhead and rise vertically where least exposed to damage.
  2. Connect temporary service to Owner's existing power source, as directed by electric company officials.

- H. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.
1. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
  2. Provide warning signs at power outlets other than 110 to 120 V.
  3. Provide metal conduit, tubing, or metallic cable for wiring exposed to possible damage. Provide rigid steel conduits for wiring exposed on grades, floors, decks, or other traffic areas.
  4. Provide metal conduit enclosures or boxes for wiring devices.
  5. Provide 4-gang outlets, spaced so 100-foot extension cord can reach each area for power hand tools and task lighting. Provide a separate 125-V ac, 20-A circuit for each outlet.
- I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.
1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
  2. Provide one 100-W incandescent equivalent lamp per 500 sq. ft., uniformly distributed, for general lighting, or equivalent illumination.
  3. Provide one 100-W incandescent equivalent lamp every 50 feet in traffic areas.
  4. Provide one 100-W incandescent equivalent lamp per story in stairways and ladder runs, located to illuminate each landing and flight.
  5. Install exterior-yard site lighting that will provide adequate illumination for construction operations, traffic conditions, and signage visibility when the Work is being performed.
- J. Telephone Service: Provide temporary telephone service throughout construction period for common-use facilities used by all personnel engaged in construction activities. Install separate telephone line for each field office and first-aid station.
1. Provide additional telephone lines for the following:
    - a. In field office with more than two occupants, install a telephone for each additional occupant or pair of occupants.
    - b. Provide a dedicated telephone line for each facsimile machine and computer with modem in each field office.
    - c. Provide a separate telephone line for Owner's use.
    - d. Install a telephone on every second or third story of construction.
  2. At each telephone, post a list of important telephone numbers.
    - a. Police and fire departments.
    - b. Ambulance service.
    - c. Contractor's home office.
    - d. Architect's office.
    - e. Engineers' offices.
    - f. Owner's office.
    - g. Principal subcontractors' field and home offices.
  3. Provide an answering machine or voice-mail service on superintendent's telephone.
  4. Provide a portable cellular telephone for superintendent's use in making and receiving telephone calls when away from field office.

5. Provide a computer and printer for Contractor's, Owner's, Architect's and other members of the Construction Team's use in making and receiving correspondence from the Architect and subcontractors. Provide with internet-enabled routing and wireless access for e-mail communication and use of wireless devices. Computer shall conform to the following:
  - a. Processor: Intel Core2 Duo or Intel i3, i5, i7, 2.5 GHz processing speed.
  - b. Memory: 4 gigabyte.
  - c. Disk Storage: 250 gigabyte hard-disk drive and combination DVD-RW/CD-RW drive.
  - d. Display: 22-inch LCD monitor with 256-Mb dedicated video RAM.
  - e. Full-size keyboard and mouse.
  - f. Network Connectivity: 10/100BaseT Ethernet. If encrypted, provide both SSID and encryption password to Architect and Owner.
  - g. Operating System: Microsoft Windows 7 or higher.
  - h. Productivity Software:
    - 1) Microsoft Office Professional, 7 or higher, including Word, Excel, and Outlook.
    - 2) Adobe Reader 9.0 or higher.
    - 3) WinZip 7.0 or higher.
  - i. Printer: "All-in-one" unit equipped with printer server, combining color printing, photocopying, scanning, and faxing, or separate units for each of these three functions.
  - j. Internet Service: Broadband modem, router and ISP, equipped with hardware firewall, providing minimum 1.5 Mbps upload and 3 Mbps download speeds at each computer.
  - k. Internet Security: Integrated software, providing software firewall, virus, spyware, phishing, and spam protection in a combined application.
  - l. Backup: External hard drive, minimum 1 TB, with automated backup software providing daily backups.
  - m. Wireless Coverage: Wireless service shall extend over entire construction area, including each floor.

### 3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
  1. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."
  2. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
  3. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate to support loads and to withstand exposure to traffic during construction period. Locate temporary roads and paved areas within construction limits indicated on Drawings.
  1. Provide a reasonably level, graded, well-drained subgrade of satisfactory soil material, compacted to not less than 95 percent of maximum dry density in the top 6 inches.
  2. Provide gravel paving course of subbase material not less than 3 inches thick; roller compacted to a level, smooth, dense surface.
  3. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

- C. Traffic Controls: Provide temporary traffic controls at junction of temporary roads with public roads. Include warning signs for public traffic and "STOP" signs for entrance onto public roads. Comply with requirements of authorities having jurisdiction.
- D. Dewatering Facilities and Drains: Comply with requirements in applicable Division 2 Sections for temporary drainage and dewatering facilities and operations not directly associated with construction activities included in individual Sections. Where feasible, use same facilities. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining property nor endanger permanent Work or temporary facilities.
  2. Before connection and operation of permanent drainage piping system, provide temporary drainage where roofing or similar waterproof deck construction is completed.
  3. Remove snow and ice as required to minimize accumulations.
- E. Project Identification and Temporary Signs: Prepare Project identification and other signs in sizes indicated. Install signs where indicated to inform public and persons seeking entrance to Project. Do not permit installation of unauthorized signs.
1. Engage an experienced sign painter to apply graphics for Project identification signs. Comply with details indicated.
  2. Prepare temporary signs to provide directional information to construction personnel and visitors.
  3. Construct signs of exterior-type Grade B-B high-density concrete form overlay plywood in sizes and thicknesses indicated. Support on posts or framing of preservative-treated wood or steel.
  4. Paint sign panel and applied graphics with exterior-grade alkyd gloss enamel over exterior primer.
  5. Provide one 72 inches high x 96 inches wide project sign with text as follows:
    - a. Name of Project - allow 2 lines.
    - b. Name of Owner - allow 2 lines.
    - c. Owner's Logo - allow 24 inches x 16 inches space.
    - d. Name of Architect - allow 4 lines.
    - e. Architect's Logo - allow (2) 24 inches x 16 inches spaces.
    - f. Name of Contractor - allow 2 lines.
    - g. Contractor's Logo - allow 24" x 16" space.
    - h. Allow 24 additional lines.
    - i. Allow for rendering of building.
- F. Waste Disposal Facilities:
1. Establish a system for daily collection and disposal of waste or extraneous materials from all construction areas on site that may present a hazard to the project, its craftsmen and the expeditious construction of the work. The Contractor shall provide to the Owner a satisfactory method to assure clean-up is performed in a timely and expeditious fashion. Enforce requirements strictly. Do not hold collected materials at the site longer than 7 days during normal weather or 3 days when the daily temperature is expected to rise above 80 degrees F. Handle waste materials that are hazardous, dangerous, or unsanitary separately from other inert waste by containerizing appropriately. Dispose of waste material in a lawful manner.
    - a. Burying or burning of waste materials on the site will not be permitted.
    - b. Washing waste materials down sewers or into waterways will not be permitted.
    - c. Provide rodent proof containers located on each floor level of construction work, to encourage depositing of lunch garbage and similar wastes by construction personnel.

2. The Owner reserves the right to withhold payments and perform the clean-up, if necessary, at the expense of the Contractor, if unsatisfactory clean-up efforts are not performed in a timely fashion.
- G. Common-Use Field Office: Provide an insulated, weathertight, air-conditioned field office for use as a common facility by all personnel engaged in construction activities; of sufficient size to accommodate required office personnel and meetings of 12 persons at Project site. Keep office clean and orderly.
1. Furnish and equip offices as follows:
    - a. Desk and four chairs, four-drawer file cabinet, a plan table, a plan rack, and bookcase.
    - b. Provide a room of not less than 240 sq. ft. for Project meetings. Furnish room with conference table, 12 folding chairs, and 4-foot- square tack board.
  2. Provide resilient floor covering and painted gypsum wallboard walls and acoustical ceiling. Provide operable windows with adjustable blinds and insect screens.
  3. Provide an electric heater with thermostat capable of maintaining a uniform indoor temperature of 68 degrees F. Provide an air-conditioning unit capable of maintaining an indoor temperature of 72 degrees F.
  4. Provide fluorescent light fixtures capable of maintaining average illumination of 20 fc at desk height. Provide 110- to 120-V duplex outlets spaced at not more than 12-foot intervals, 1 per wall in each room.
  5. Owner's Inspector's Office: Contractor shall provide a separate office/trailer, minimum 8 feet x 12 feet, to be used by the Owner's inspector. Office shall be equipped with a separate phone line, fax line, bottled water facility, lighting, heat, cooling and minimum 6 foot long plan table. Entrance to office shall be controlled by the Owner.
- H. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility services. Sheds may be open shelters or fully enclosed spaces within building or elsewhere on-site.
- I. Lifts and Hoists: Provide facilities for hoisting materials and personnel. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- J. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished, permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of acceptance.

### **3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION**

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near Project site.

- B. Stormwater Control: Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of stormwater from heavy rains.
- C. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from construction damage. Protect tree root systems from damage, flooding, and erosion.
- D. Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest-control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Engage this pest-control service to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.
- E. Site Enclosure Fence: Before construction operations begin, install chain-link enclosure fence with lockable entrance gates. Locate where indicated, or enclose entire Project site or portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering site except by entrance gates.
  - 1. Set fence posts in concrete bases.
  - 2. Provide gates in sizes and at locations necessary to accommodate delivery vehicles and other construction operations.
  - 3. Maintain security by limiting number of keys and restricting distribution to authorized personnel.
- F. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
- G. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing red or amber lights.
  - 1. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch- thick exterior plywood.
- H. Covered Walkway: Where required, erect a structurally adequate, protective, covered walkway for passage of persons along adjacent public street. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.
- I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
  - 1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
  - 2. Vertical Openings: Close openings of 25 sq. ft. or less with plywood or similar materials.



3. Horizontal Openings: Close openings in floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
  4. Install tarpaulins securely using fire-retardant-treated wood framing and other materials.
  5. Where temporary wood or plywood enclosure exceeds 100 sq. ft. in area, use fire-retardant-treated material for framing and main sheathing.
- J. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.
1. Construct dustproof partitions of not less than nominal 4-inch studs, 5/8-inch gypsum wallboard with joints taped on occupied side, and 1/2-inch fire-retardant plywood on construction side.
  2. Insulate partitions to provide noise protection to occupied areas.
  3. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
  4. Protect air-handling equipment.
  5. Weatherstrip openings.
- K. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
1. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.
    - a. Field Offices: Class A stored-pressure water-type extinguishers.
    - b. Other Locations: Class ABC dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.
    - c. Locate fire extinguishers where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor at or near each usable stairwell.
  2. Store combustible materials in containers in fire-safe locations.
  3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting. Prohibit smoking in hazardous fire-exposure areas.
  4. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
  5. Permanent Fire Protection: At earliest feasible date in each area of Project, complete installation of permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
  6. Develop and supervise an overall fire-prevention and first-aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
  7. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

### **3.5 OPERATION, TERMINATION, AND REMOVAL**

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

- B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
  2. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- C. Temporary Facility Changeover: Except for using permanent fire protection as soon as available, do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are the property of Contractor. Owner reserves right to take possession of Project identification signs.
  2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
  3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in Division 1 Section "Closeout Procedures."

**END OF SECTION**

## SECTION 01 5713

### TEMPORARY EROSION AND SEDIMENT CONTROL

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section

##### 1.2 SUMMARY

- A. **Section Includes:**
  - 1. Prevention of erosion due to construction activities.
  - 2. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.
  - 3. Restoration of areas eroded due to insufficient preventive measures.
  - 4. Performance bond.
  - 5. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.
- B. **Related Requirements:**
  - 1. Section 31 1100 "Site Clearing" for limits on clearing; disposition of vegetative clearing debris.
  - 2. Section 31 2316 "Excavation" for temporary and permanent grade changes for erosion control.
  - 3. Section 32 1123 "Crushed Aggregate Base" for temporary and permanent roadways.

##### 1.3 REFERENCE STANDARDS

- A. ASTM D4355 - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc Type Apparatus; 2007.
- B. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 1999a (Reapproved 2009).
- C. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 2011.
- D. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 2008.
- E. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile; 2012.
- F. ASTM D4873 - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples; 2002 (Reapproved 2009).
- G. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; current edition.

## 1.4 PERFORMANCE REQUIREMENTS

- A. Comply with all requirements of U.S. Environmental Protection Agency for erosion and sedimentation control, as specified for the National Pollutant Discharge Elimination System (NPDES), Phases I and II, under requirements for the 2003 Construction General Permit (CGP), whether the project is required by law to comply or not.
- B. Also comply with all more stringent requirements of State of Utah Erosion and Sedimentation Control Manual.
- C. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.
- D. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
  - 1. Obtain and pay for permits and provide security required by authority having jurisdiction.
- E. Provide to Owner a Performance Bond covering erosion and sedimentation preventive measures only, in an amount equal to 100 percent of the cost of erosion and sedimentation control work.
- F. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.
- G. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
  - 1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
  - 2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.
- H. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
  - 1. Control movement of sediment and soil from temporary stockpiles of soil.
  - 2. Prevent development of ruts due to equipment and vehicular traffic.
  - 3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- I. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
  - 1. Prevent windblown soil from leaving the project site.
  - 2. Prevent tracking of mud onto public roads outside site.
  - 3. Prevent mud and sediment from flowing onto sidewalks and pavements.
  - 4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

- J. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
  - 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
  - 2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.
  
- K. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
  - 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
  
- L. Open Water: Prevent standing water that could become stagnant.
  
- M. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

## 1.5 SUBMITTALS

- A. Erosion and Sedimentation Control Plan:
  - 1. Submit within 2 weeks after Notice to Proceed.
  - 2. Include:
    - a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.
    - b. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
    - c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
    - d. Schedule of temporary preventive measures, in relation to ground disturbing activities.
    - e. Other information required by law.
    - f. Format required by law is acceptable, provided any additional information specified is also included.
  - 3. Obtain the approval of the Plan by authorities having jurisdiction.
  - 4. Obtain the approval of the Plan by Owner.
  
- B. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.
  
- C. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.
  
- D. Photographic Evidence: Time-stamped photographs demonstrating compliance with Erosion and Sedimentation Control plan for LEED certification.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Mulch: Use one of the following:
  - 1. Straw or hay.
  - 2. Erosion control matting or netting.
  
- B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.
  
- C. Bales: Air dry, rectangular straw bales.
  - 1. Cross Section: 14 by 18 inches, minimum.
  - 2. Bindings: Wire or string, around long dimension.
  
- D. Bale Stakes: One of the following, minimum 3 feet long:
  - 1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.
  - 2. Wood, 2 by 2 inches in cross section.
  
- E. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
  - 1. Average Opening Size: 30 U.S. Std. Sieve (0.600 mm), maximum, when tested in accordance with ASTM D4751.
  - 2. Permittivity:  $0.05 \text{ sec}^{-1}$ , minimum, when tested in accordance with ASTM D4491.
  - 3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355 after 500 hours exposure.
  - 4. Tensile Strength: 100 lb-f, minimum, in cross-machine direction; 124 lb-f (550 N), minimum, in machine direction; when tested in accordance with ASTM D4632.
  - 5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632.
  - 6. Tear Strength: 55 lb-f, minimum, when tested in accordance with ASTM D4533.
  - 7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.
  
- F. Silt Fence Posts: One of the following, minimum 5 feet long:
  - 1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.
  - 2. Softwood, 4 by 4 inches in cross section.
  - 3. Hardwood, 2 by 2 inches in cross section.
  
- G. Gravel: See Section 32 1123 for aggregate.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

### 3.2 PREPARATION

- A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

### 3.3 SCOPE OF PREVENTIVE MEASURES

- A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.
- B. Construction Entrances: Traffic-bearing aggregate surface.
  - 1. Width: As required; 20 feet, minimum.
  - 2. Length: 50 feet, minimum.
  - 3. Provide at each construction entrance from public right-of-way.
  - 4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.
- C. Linear Sediment Barriers: Made of silt fences.
  - 1. Provide linear sediment barriers:
    - a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
  - 2. Space sediment barriers with the following maximum slope length upslope from barrier:
    - a. Slope of Less Than 2 Percent: 100 feet.
    - b. Slope Between 2 and 5 Percent: 75 feet.
    - c. Slope Between 5 and 10 Percent: 50 feet.
    - d. Slope Between 10 and 20 Percent: 25 feet.
    - e. Slope Over 20 Percent: 15 feet.
- D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:
  - 1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
  - 2. Straw bale row blocking entire inlet face area; anchor into pavement.
- E. Storm Drain Drop Inlet Sediment Traps: As detailed on Drawings.
- F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.
- G. Soil Stockpiles: Protect using one of the following measures:
  - 1. Cover with polyethylene film, secured by placing soil on outer edges.
  - 2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw or hay.
- H. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
- I. Temporary Seeding: Use where temporary vegetated cover is required.

### 3.4 INSTALLATION

- A. Traffic-Bearing Aggregate Surface:
1. Excavate minimum of 6 inches.
  2. Place geotextile fabric full width and length, with minimum 12 inch overlap at joints.
  3. Place and compact at least 6 inches of 1.5 to 3.5 inch diameter stone.
- B. Silt Fences:
1. Store and handle fabric in accordance with ASTM D4873.
  2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
  3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
  4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
  5. Install with top of fabric at nominal height and embedment as specified.
  6. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
  7. Fasten fabric to wood posts using one of the following:
    - a. Four 3/4 inch diameter, 1 inch long, 14 gage nails.
    - b. Five 17-gage staples with 3/4 inch wide crown and 1/2 inch legs.
  8. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.
  9. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet.
- C. Straw Bale Rows:
1. Install bales in continuous rows with ends butting tightly, with one bale at each end of row turned uphill.
  2. Install bales so that bindings are not in contact with the ground.
  3. Embed bales at least 4 inches in the ground.
  4. Anchor bales with at least two stakes per bale, driven at least 18 inches (450 mm) into the ground; drive first stake in each bale toward the previously placed bale to force bales together.
  5. Fill gaps between ends of bales with loose straw wedged tightly.
  6. Place soil excavated for trench against bales on the upslope side of the row, compacted.
- D. Mulching Over Large Areas:
1. Dry Straw and Hay: Apply 2-1/2 tons per acre; anchor using dull disc harrow or emulsified asphalt applied using same spraying machine at 100 gallons of water per ton of mulch.
  2. Erosion Control Matting: Comply with manufacturer's instructions.
- E. Mulching Over Small and Medium Areas:
1. Dry Straw and Hay: Apply 4 to 6 inches depth.
  2. Erosion Control Matting: Comply with manufacturer's instructions.



- F. Temporary Seeding:
1. When hydraulic seeder is used, seedbed preparation is not required.
  2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
  3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft.
  4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft.
  5. Incorporate fertilizer into soil before seeding.
  6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch deep.
  7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
  8. Repeat irrigation as required until grass is established.

### **3.5 MAINTENANCE**

- A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.
- B. Repair deficiencies immediately.
- C. Silt Fences:
1. Promptly replace fabric that deteriorates unless need for fence has passed.
  2. Remove silt deposits that exceed one-third of the height of the fence.
  3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- D. Straw Bale Rows:
1. Promptly replace bales that fall apart or otherwise deteriorate unless need has passed.
  2. Remove silt deposits that exceed one-half of the height of the bales.
  3. Repair bale rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- E. Clean out temporary sediment control structures weekly and relocate soil on site.
- F. Place sediment in appropriate locations on site; do not remove from site.

### **3.6 CLEAN UP**

- A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect.
- B. Clean out temporary sediment control structures that are to remain as permanent measures.
- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

**END OF SECTION**

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## SECTION 01 6000

### PRODUCT REQUIREMENTS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following administrative and procedural requirements: selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
- B. Related Sections include the following:
  - 1. Section 01 1900 "Definitions and Standards" for applicable industry standards for products specified.
  - 2. Section 01 7700 "Closeout Procedures" for submitting warranties for contract closeout.
  - 3. Divisions 2 through 48 Sections for specific requirements for warranties on products and installations specified to be warranted.

##### 1.3 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature, which is current as of date of the Contract Documents.
  - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
  - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named or unnamed manufacturers.

- D. **Manufacturer's Warranty:** Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
- E. **Special Warranty:** Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

#### **1.4 SUBMITTALS**

- A. **Product List:** Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
  - 1. **Coordination:** Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
  - 2. **Form:** Tabulate information for each product under the following column headings:
    - a. Specification Section number and title.
    - b. Generic name used in the Contract Documents.
    - c. Proprietary name, model number, and similar designations.
    - d. Manufacturer's name and address.
    - e. Supplier's name and address.
    - f. Installer's name and address.
    - g. Projected delivery date or time span of delivery period.
    - h. Identification of items that require early submittal approval for scheduled delivery date.
  - 3. **Initial Submittal:** Within 30 days after date of commencement of the Work, submit 3 copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.
    - a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
  - 4. **Completed List:** Within 60 days after date of commencement of the Work, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
  - 5. **Architect's Action:** Architect will respond in writing to Contractor within 15 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement that products comply with the Contract Documents.
- B. **Substitution Requests:** Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. **Substitution Request Form:** Use CSI Form 13.1A.
  - 2. **Documentation:** Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified material or product cannot be provided.
    - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, which will be necessary to accommodate proposed substitution.

- c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
  - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
  - e. Samples, where applicable or requested.
  - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
  - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
  - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
  - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
  - j. Cost information, including a proposal of change, if any, in the Contract Sum.
  - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
  - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 business days of receipt of request, or 7 business days of receipt of additional information or documentation, whichever is later.
- a. Form of Acceptance: Change Order.
  - b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.
- C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittals." Show compliance with requirements.

## 1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
- 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
  - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

## 1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
  - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
  - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
  - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
  - 4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
  - 5. Store products to allow for inspection and measurement of quantity or counting of units.
  - 6. Store materials in a manner that will not endanger Project structure.
  - 7. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
  - 8. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
  - 9. Protect stored products from damage.

## 1.7 PRODUCT WARRANTIES

- A. General: Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
  - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
  - 2. Refer to Divisions 2 through 48 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

## PART 2 - PRODUCTS

### 2.1 PRODUCT OPTIONS

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.
  - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
  - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
  - 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

4. Where products are accompanied by the term "as selected," Architect will make selection.
  5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
  6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
  7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures: Procedures for product selection include the following:
1. Product: Where Specification paragraphs or subparagraphs titled "Product" name a single product and manufacturer, provide the product named.
    - a. Substitutions may be considered, unless otherwise indicated.
  2. Manufacturer/Source: Where Specification paragraphs or subparagraphs titled "Manufacturer" or "Source" name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements.
    - a. Substitutions may be considered, unless otherwise indicated.
  3. Products: Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
    - a. Substitutions may be considered, unless otherwise indicated.
  4. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
    - a. Substitutions may be considered, unless otherwise indicated.
  5. Available Products: Where Specification paragraphs or subparagraphs titled "Available Products" introduce a list of names of both products and manufacturers, provide one of the products listed or another product that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
  6. Available Manufacturers: Where Specification paragraphs or subparagraphs titled "Available Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed or another manufacturer that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
  7. Product Options: Where Specification paragraphs titled "Product Options" indicate that size, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide either the specific product or system indicated or a comparable product or system by another manufacturer. Comply with provisions in "Product Substitutions" Article.
  8. Basis-of-Design Products: Where Specification paragraphs or subparagraphs titled "Basis-of-Design Products" are included and also introduce or refer to a list of manufacturers' names, provide either the specified product or a comparable product by one of the other named (or unnamed) manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
    - a. Substitutions may be considered, unless otherwise indicated.
  9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches satisfactorily.
    - a. If no product available within specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents on "substitutions" for selection of a matching product.

10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.
  - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.
  - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.

## 2.2 PRODUCT SUBSTITUTIONS

- A. Timing: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.
- B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
  1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
  2. Requested substitution does not require extensive revisions to the Contract Documents.
  3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
  4. Substitution request is fully documented and properly submitted.
  5. Requested substitution will not adversely affect Contractor's Construction Schedule.
  6. Requested substitution has received necessary approvals of authorities having jurisdiction.
  7. Requested substitution is compatible with other portions of the Work.
  8. Requested substitution has been coordinated with other portions of the Work.
  9. Requested substitution provides specified warranty.
  10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

## 2.3 COMPARABLE PRODUCTS

- A. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:
  1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
  2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.



3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**

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## SECTION 01 7300

### EXECUTION

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. General installation of products.
  - 4. Progress cleaning.
  - 5. Starting and adjusting.
  - 6. Protection of installed construction.
  - 7. Correction of the Work.
- B. Related Sections include the following:
  - 1. Section 01 3100 "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
  - 2. Section 01 3300 "Submittals" for administrative submittals and also product and procedural submittals.
  - 3. Section 01 7700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

##### 1.3 SUBMITTALS

- A. Qualification Data: For land surveyor/professional engineer to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- B. Certificates: Submit certificate signed by land surveyor/professional engineer certifying that location and elevation of improvements comply with requirements.
- C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- D. Certified Surveys: Submit two copies signed by land surveyor/professional engineer.
- E. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

##### 1.4 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

## **PART 2 - PRODUCTS (NOT USED)**

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
  2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
    - a. Description of the Work.
    - b. List of detrimental conditions, including substrates.
    - c. List of unacceptable installation tolerances.
    - d. Recommended corrections.
  2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
  3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

### **3.2 PREPARATION**

- A. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Architect and Owner not less than two business days in advance of proposed utility interruptions.
  2. Do not proceed with utility interruptions without Architect's and Owner's written permission.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

### **3.3 CONSTRUCTION LAYOUT**

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor/professional engineer to lay out the Work using accepted surveying practices.
  - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  - 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  - 3. Inform installers of lines and levels to which they must comply.
  - 4. Check the location, level and plumb, of every major element as the Work progresses.
  - 5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
  - 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

### **3.4 FIELD ENGINEERING**

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
  - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
  - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
  - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
  - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
  - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- E. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor/professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
  - 1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
  - 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

### **3.5 INSTALLATION**

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  - 1. Make vertical work plumb and make horizontal work level.
  - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
  - 4. Maintain minimum headroom clearance as indicated in spaces without a suspended ceiling.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
  - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  - 2. Allow for building movement, including thermal expansion and contraction.
- G. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

- H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

### **3.6 PROGRESS CLEANING**

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
  - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  - 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 degrees F.
  - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
  - 1. Remove liquid spills promptly.
  - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.
  - 1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.
- H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- I. Protection: During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- J. Maintenance: Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure smooth operation without damaging effects.
- K. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

### **3.7 DUST CONTROL**

- A. Provide continuous (7 days per week, 24 hours per day) fugitive dust control measures within the limits of the construction site, related sites and adjacent streets and roads. Dust control shall be provided for, but not be specifically limited to, the stabilization of unpaved roads, haul roads, access roads, spoil sites, borrow and material sources, excavations, embankments, stockpiles, and all other areas which become potential sources of dust as a result of construction activities.
- B. Maintain compliance with the General Utah Air Pollution Regulations, R446 - Utah Air Conservation Regulations, Section 4.5, Fugitive Emissions, applicable County Air Pollution Control Ordinances, and as directed by the Architect. Dust control measures shall include but not be limited to the following:
  - 1. Wetting of surfaces with water as appropriate.
  - 2. Minimizing surface disturbances.
- C. In order to control fugitive dust emissions, apply the following procedures and techniques:
  - 1. Cover loads of materials, debris and waste materials taken from construction sites as needed to suppress dust during transit.
  - 2. Water down or apply other approved dust control measures to the construction site, haul roads and public access roads as needed to suppress dust.
  - 3. All mud and dirt shall be removed from vehicles prior to entering a paved or graveled area or road. Any mud or dirt that is carried out onto paved or graveled surfaces shall be removed from surfaces immediately and no less than daily.

### **3.8 STARTING AND ADJUSTING**

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

### **3.9 PROTECTION OF INSTALLED CONSTRUCTION**

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

### **3.10 CORRECTION OF THE WORK**

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."
  - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.



- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

**END OF SECTION**

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## SECTION 01 7700

### CLOSEOUT PROCEDURES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Inspection procedures.
  - 2. Project Record Documents.
  - 3. Operation and maintenance manuals.
  - 4. Warranties.
  - 5. Instruction of Owner's personnel.
  - 6. Final cleaning.
- B. Related Sections include the following:
  - 1. Section 01 2900 "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
  - 2. Section 01 7300 "Execution Requirements" for progress cleaning of Project site.
  - 3. Section 01 7820 "Operation and Maintenance Data" for operation and maintenance manual requirements.
  - 4. Divisions 2 through 48 Sections for specific closeout and special cleaning requirements for products of those Sections.

##### 1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request. Verify desired format for submission of documents – provide electronic copies if requested by Owner or Architect.
  - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
  - 2. Advise Owner of pending insurance changeover requirements.
  - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  - 5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
  - 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
  - 7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  - 8. Complete startup testing of systems.
  - 9. Submit test/adjust/balance records.

10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  11. Advise Owner of changeover in heat and other utilities.
  12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
  13. Complete final cleaning requirements, including touchup painting.
  14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
  2. Results of completed inspection will form the basis of requirements for Final Completion.

#### **1.4 FINAL COMPLETION**

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
  2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
  4. Submit pest-control final inspection report and warranty.
  5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
- C. Additional Review Fees: Should Architect perform more than one additional review, or extend its construction period services more than 15 business days beyond the scheduled completion date, due to the failure of the Contractor's work to comply with the claims of status or completion made by the Contractor, Owner will compensate Architect for such additional/ extended services at the rate of \$500.00 per day. The Owner shall then deduct the amount of such compensation from the final payment to the Contractor.

## 1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
  2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
  3. Include the following information at the top of each page:
    - a. Project name.
    - b. Date.
    - c. Name of Architect.
    - d. Name of Contractor.
    - e. Page number.

## 1.6 PROJECT RECORD DOCUMENTS

- A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.
- B. Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.
1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
    - a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
    - b. Accurately record information in an understandable drawing technique.
    - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
    - d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.
  2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
  3. Mark important additional information that was either shown schematically or omitted from original Drawings.
  4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
  5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.

- C. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
  - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  - 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
  - 3. Note related Change Orders, Record Drawings, and Product Data, where applicable.
  
- D. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.
  - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  - 3. Note related Change Orders, Record Drawings, and Record Specifications, where applicable.
  
- E. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
  
- F. If requested by the Owner or Architect, submit record documents in electronic form, in agreed-upon format.

## 1.7 OPERATION AND MAINTENANCE MANUALS

- A. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:
  - 1. Operation Data:
    - a. Emergency instructions and procedures.
    - b. System, subsystem, and equipment descriptions, including operating standards.
    - c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
    - d. Description of controls and sequence of operations.
    - e. Piping diagrams.
  - 2. Maintenance Data:
    - a. Manufacturer's information, including list of spare parts.
    - b. Name, address, and telephone number of Installer or supplier.
    - c. Maintenance procedures.
    - d. Maintenance and service schedules for preventive and routine maintenance.
    - e. Maintenance record forms.
    - f. Sources of spare parts and maintenance materials.
    - g. Copies of maintenance service agreements.
    - h. Copies of warranties and bonds.

- B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.
- C. Provide documentation as outlined in Division 1 Section "General Commissioning Requirements" demonstrating systems are functioning per Contract Documents.
- D. If requested by the Owner or Architect, submit operation and maintenance documents in electronic form, in agreed-upon format.

## **1.8 WARRANTIES**

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
  - 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
  - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
  - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.
- D. If requested by the Owner or Architect, submit warranty documents in electronic form, in agreed-upon format.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

## **PART 3 - EXECUTION**

### **3.1 DEMONSTRATION AND TRAINING**

- A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
  - 1. Provide instructors experienced in operation and maintenance procedures.
  - 2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.

3. Schedule training with Owner, through Architect, with at least seven days' advance notice.
  4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.
- B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:
1. System design and operational philosophy.
  2. Review of documentation.
  3. Operations.
  4. Adjustments.
  5. Troubleshooting.
  6. Maintenance.
  7. Repair.

### 3.2 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    - e. Remove snow and ice to provide safe access to building.
    - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    - h. Sweep concrete floors broom clean in unoccupied spaces.
    - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
    - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
    - k. Remove labels that are not permanent.



- l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
    - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
  - m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
  - n. Replace parts subject to unusual operating conditions.
  - o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
  - p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grilles.
  - q. Clean ducts, blowers, and coils if units were operated without filters during construction.
  - r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
  - s. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
- D. Cleaning Standards: Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

**END OF SECTION**

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## SECTION 01 7823

### OPERATION AND MAINTENANCE DATA

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. **This** Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory.
  - 2. Emergency manuals.
  - 3. Operation manuals for systems, subsystems, and equipment.
  - 4. Maintenance manuals for the care and maintenance of products, materials, and finishes systems and equipment.
- B. Related Sections include the following:
  - 1. Section 01 3300 "Submittals" for submitting copies of submittals for operation and maintenance manuals.
  - 2. Section 01 7700 "Closeout Procedures" for submitting operation and maintenance manuals.
  - 3. Section 01 9113 "General Commissioning Requirements" for documentation demonstrating proper functioning of building systems.
  - 4. Divisions 2 through 48 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

##### 1.3 DEFINITIONS

- A. **System:** An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. **Subsystem:** A portion of a system with characteristics similar to a system.

##### 1.4 SUBMITTALS

- A. **Initial Submittal:** Submit 2 draft copies of each manual at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect will return one copy of draft and mark whether general scope and content of manual are acceptable.
- B. **Final Submittal:** Submit 2 of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.
  - 1. Correct or modify each manual to comply with Architect's comments. Submit 3 copies of each corrected manual within 15 days of receipt of Architect's comments.
  - 2. Furnish, in addition to hard copies, an electronic copy of each manual, bookmarked for searching.

## 1.5 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

## PART 2 - PRODUCTS

### 2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
  - 1. List of documents.
  - 2. List of systems.
  - 3. List of equipment.
  - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

### 2.2 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
  - 1. Title page.
  - 2. Table of contents.
  - 3. Manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
  - 1. Subject matter included in manual.
  - 2. Name and address of Project.
  - 3. Name and address of Owner.
  - 4. Date of submittal.
  - 5. Name, address, and telephone number of Contractor.
  - 6. Name and address of Architect.
  - 7. Cross-reference to related systems in other operation and maintenance manuals.

- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
    - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
  2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
  3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
  4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
  5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
    - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

## 2.3 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
1. Type of emergency.
  2. Emergency instructions.
  3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire.
  2. Flood.
  3. Gas leak.
  4. Water leak.
  5. Power failure.
  6. Water outage.
  7. System, subsystem, or equipment failure.
  8. Chemical release or spill.

- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
  - 1. Instructions on stopping.
  - 2. Shutdown instructions for each type of emergency.
  - 3. Operating instructions for conditions outside normal operating limits.
  - 4. Required sequences for electric or electronic systems.
  - 5. Special operating instructions and procedures.

## 2.4 OPERATION MANUALS

- A. **Content:** In addition to requirements in this Section, include operation data required in **individual Specification Sections and the following information:**
  - 1. **System, subsystem, and equipment descriptions.**
  - 2. **Performance and design criteria if Contractor is delegated design responsibility.**
  - 3. **Operating standards.**
  - 4. **Operating procedures.**
  - 5. **Operating logs.**
  - 6. **Wiring diagrams.**
  - 7. **Control diagrams.**
  - 8. **Piped system diagrams.**
  - 9. **Precautions against improper use.**
  - 10. **License requirements including inspection and renewal dates.**
- B. **Descriptions:** Include the following:
  - 1. Product name and model number.
  - 2. Manufacturer's name.
  - 3. Equipment identification with serial number of each component.
  - 4. Equipment function.
  - 5. Operating characteristics.
  - 6. Limiting conditions.
  - 7. Performance curves.
  - 8. Engineering data and tests.
  - 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
  - 1. Startup procedures.
  - 2. Equipment or system break-in procedures.
  - 3. Routine and normal operating instructions.
  - 4. Regulation and control procedures.
  - 5. Instructions on stopping.
  - 6. Normal shutdown instructions.
  - 7. Seasonal and weekend operating instructions.
  - 8. Required sequences for electric or electronic systems.
  - 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

## **2.5 PRODUCT MAINTENANCE MANUAL**

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
  - 1. Product name and model number.
  - 2. Manufacturer's name.
  - 3. Color, pattern, and texture.
  - 4. Material and chemical composition.
  - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
  - 1. Inspection procedures.
  - 2. Types of cleaning agents to be used and methods of cleaning.
  - 3. List of cleaning agents and methods of cleaning detrimental to product.
  - 4. Schedule for routine cleaning and maintenance.
  - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

## **2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL**

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
  - 1. Standard printed maintenance instructions and bulletins.
  - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  - 3. Identification and nomenclature of parts and components.
  - 4. List of items recommended to be stocked as spare parts.

- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
  1. Test and inspection instructions.
  2. Troubleshooting guide.
  3. Precautions against improper maintenance.
  4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  5. Aligning, adjusting, and checking instructions.
  6. Demonstration and training videotape, if available.
  
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
  1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
  
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
  
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
  
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  1. Include procedures to follow and required notifications for warranty claims.

## **PART 3 - EXECUTION**

### **3.1 MANUAL PREPARATION**

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
  
- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
  
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
  
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
  1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.



- E. **Manufacturers' Data:** Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. **Drawings:** Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
1. Do not use original Project Record Documents as part of operation and maintenance manuals.
  2. Comply with requirements of newly prepared Record Drawings in Division 1 Section "Project Record Documents."
- G. Comply with Division 1 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

**END OF SECTION**

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## SECTION 01 7900

### DEMONSTRATION AND TRAINING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
  - 1. Demonstration of operation of systems, subsystems, and equipment.
  - 2. Training in operation and maintenance of systems, subsystems, and equipment.
  - 3. Demonstration and training digital video recordings.
- B. Related Sections include the following:
  - 1. Section 01 3100 "Project Management and Coordination" for requirements for pre-instruction conferences.
  - 2. Divisions 2 through 48 Sections for specific requirements for demonstration and training for products in those Sections.
- C. Unit Price for Instruction Time: Length of instruction time will be measured by actual time spent performing demonstration and training in required location. No payment will be made for time spent assembling educational materials, setting up, or cleaning up.

##### 1.3 SUBMITTALS

- A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
  - 1. At completion of training, submit two complete training manual(s) for Owner's use.
- B. Qualification Data: For firms and persons specified in Quality Assurance Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners and other information specified.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
- D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

- E. Demonstration and Training Videotapes or Digital Recordings: Submit two copies within seven days of end of each training module.
1. Identification: On each copy, provide an applied label with the following information:
    - a. Name of Project.
    - b. Name and address of photographer.
    - c. Name of Architect and Construction Manager.
    - d. Name of Contractor.
    - e. Date videotape was recorded.
    - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
  2. Transcript: Prepared on 8-1/2-by-11-inch paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding videotape. Include name of Project and date of videotape on each page.

#### **1.4 QUALITY ASSURANCE**

- A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 1 Section "Quality Requirements," experienced in operation and maintenance procedures and training.
- B. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.
- C. Pre-instruction Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
1. Inspect and discuss locations and other facilities required for instruction.
  2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
  3. Review required content of instruction.
  4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

#### **1.5 COORDINATION**

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.
- D. Coordinate Commissioning Authority activities and Division 1 Section "General Commissioning Requirements" with instruction.

## PART 2 - PRODUCTS

### 2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
1. Motorized doors, including overhead coiling doors and automatic entrance doors.
  2. Equipment, including projection screens, loading dock equipment, food-service equipment, and residential appliances.
  3. Fire-protection systems, including fire alarm and fire-extinguishing systems.
  4. Intrusion detection systems.
  5. Conveying systems, including elevators and wheelchair lifts.
  6. Heat generation, including boilers, feedwater equipment, pumps and water distribution piping.
  7. Refrigeration systems, including chillers, cooling towers, condensers, pumps and distribution piping.
  8. HVAC systems, including air-handling equipment, air distribution systems and terminal equipment and devices.
  9. HVAC instrumentation and controls.
  10. Electrical service and distribution, including transformers, switchboards, panelboards, uninterruptible power supplies and motor controls.
  11. Packaged engine generators, including transfer switches.
  12. Lighting equipment and controls.
  13. Communication systems, including intercommunication, surveillance, clocks and programming, voice and data and television equipment.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:
1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    - a. System, subsystem, and equipment descriptions.
    - b. Operating standards.
    - c. Regulatory requirements.
    - d. Equipment function.
    - e. Operating characteristics.
    - f. Limiting conditions.
    - g. Performance curves.
  2. Documentation: Review the following items in detail:
    - a. Emergency manuals.
    - b. Operations manuals.
    - c. Maintenance manuals.
    - d. Project Record Documents.
    - e. Identification systems.
    - f. Warranties and bonds.
    - g. Maintenance service agreements and similar continuing commitments.
  3. Emergencies: Include the following, as applicable:
    - a. Instructions on meaning of warnings, trouble indications, and error messages.
    - b. Instructions on stopping.
    - c. Shutdown instructions for each type of emergency.
    - d. Operating instructions for conditions outside of normal operating limits.
    - e. Sequences for electric or electronic systems.
    - f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:
  - a. Startup procedures.
  - b. Equipment or system break-in procedures.
  - c. Routine and normal operating instructions.
  - d. Regulation and control procedures.
  - e. Control sequences.
  - f. Safety procedures.
  - g. Instructions on stopping.
  - h. Normal shutdown instructions.
  - i. Operating procedures for emergencies.
  - j. Operating procedures for system, subsystem, or equipment failure.
  - k. Seasonal and weekend operating instructions.
  - l. Required sequences for electric or electronic systems.
  - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
  - a. Alignments.
  - b. Checking adjustments.
  - c. Noise and vibration adjustments.
  - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
  - a. Diagnostic instructions.
  - b. Test and inspection procedures.
7. Maintenance: Include the following:
  - a. Inspection procedures.
  - b. Types of cleaning agents to be used and methods of cleaning.
  - c. List of cleaning agents and methods of cleaning detrimental to product.
  - d. Procedures for routine cleaning
  - e. Procedures for preventive maintenance.
  - f. Procedures for routine maintenance.
  - g. Instruction on use of special tools.
8. Repairs: Include the following:
  - a. Diagnosis instructions.
  - b. Repair instructions.
  - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - d. Instructions for identifying parts and components.
  - e. Review of spare parts needed for operation and maintenance.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.
- B. Set up instructional equipment at instruction location.

### **3.2 INSTRUCTION**

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
  1. Owner will furnish Contractor with names and positions of participants.
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
  1. Schedule training with Owner, through Construction Manager, with at least 14 days' advance notice.

- C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.
- E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

### 3.3 DEMONSTRATION AND TRAINING DIGITAL VIDEO RECORDINGS

- A. General: Engage a qualified commercial photographer to record demonstration and training sessions. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
  - 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to Owner, on electronic media.
  - 1. Electronic Media: Provide read-only format compact disc acceptable to Owner, with commercial-grade graphic label.
  - 2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
  - 3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
  - 4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:
    - a. Name of Contractor/Installer.
    - b. Business address.
    - c. Business phone number.
    - d. Point of contact.
    - e. E-mail address.
- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
  - 1. Film training session(s) in segments not to exceed 15 minutes.
    - a. Produce segments to present a single significant piece of equipment per segment.
    - b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
    - c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.
- D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.
  - 1. Furnish additional portable lighting as required.
- E. Narration: Describe scenes by audio narration by microphone while session is recorded or by dubbing audio narration off-site later. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.

- F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.
- G. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

**END OF SECTION**



**DIVISION 02 - EXISTING CONDITIONS**

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**SECTION 02 4116**  
**BUILDING DEMOLITION**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes the following:
1. Demolition and removal of buildings and site improvements.
  2. Removing below-grade construction.
  3. Disconnecting, capping or sealing, and removing site utilities.
  4. Salvaging items for reuse by Owner.
- B. Related Sections:
1. Section 01 5000 "Temporary Facilities and Controls" for temporary construction, protection facilities, and environmental-protection measures for building demolition operations.
  2. Section 01 7419 "Construction Waste Management and Disposal" for development of waste management plans and Contractor's responsibilities.
  3. Civil Specification Sections for demolishing or relocating site mechanical items.
  4. Electrical Specification Sections for demolishing or relocating site electrical items.

**1.3 DEFINITIONS**

- A. Demolish: Completely remove and legally dispose of off-site.
- B. Existing to Remain or Retain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed and salvaged, or removed and reinstalled
- C. Protect: Except as otherwise defined in greater detail, the term "protect" is used to describe the process of shielding from harm existing fixtures, elements or materials.
- D. Protect and Maintain: To remove deteriorating corrosion, reapply protective coatings, and install protective measures such as temporary guards; to provide the least degree of intervention.
- E. Recycle: Recovery of demolition waste for subsequent processing in preparation for reuse.
- F. Remove: To detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- G. Remove and Salvage: To detach items from existing construction and deliver them to Owner ready for reuse.

- H. Remove and Reinstall: To detach items from existing construction, repair and clean them for reuse, and reinstall them where indicated.
- I. Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner. Include fasteners or brackets needed for reattachment elsewhere.
- J. Stabilize: To apply measures designed to reestablish a weather-resistant enclosure and the structural reinforcement of an item or portion of the building while maintaining the essential form as it exists at present.

#### **1.4 MATERIALS OWNERSHIP**

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
  - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

#### **1.5 SUBMITTALS**

- A. Qualification Data: For refrigerant recovery technician.
- B. Proposed Protection Measures: Submit informational report, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
  - 1. Adjacent Buildings: Detail special measures proposed to protect adjacent buildings to remain.
- C. Schedule of Building Demolition Activities: Indicate the following:
  - 1. Detailed sequence of demolition work, with starting and ending dates for each activity.
  - 2. Temporary interruption of utility services.
  - 3. Shutoff and capping or re-routing of utility services.
- D. Building Demolition Plans: Drawings indicating the following:
  - 1. Locations of temporary protection and means of egress for adjacent occupied buildings.
- E. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.
- F. Pre-demolition Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by building demolition operations.
- G. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

- H. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

## 1.6 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Standards: Comply with ANSI A10.6 and NFPA 241.
- D. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to building demolition including, but not limited to, the following:
  - 1. Inspect and discuss condition of construction to be demolished.
  - 2. Review structural load limitations of existing structures.
  - 3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
  - 4. Review and finalize protection requirements.
  - 5. Review procedures for noise control and dust control.
  - 6. Review procedures for protection of adjacent buildings.
  - 7. Review items to be salvaged and returned to Owner.

## 1.7 PROJECT CONDITIONS

- A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.
- B. Buildings immediately adjacent to demolition area may be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.
  - 1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
  - 2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.
    - a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.
- C. Owner assumes no responsibility for buildings and structures to be demolished.
  - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
  - 1. Hazardous materials will be removed by Owner before start of the Work.
  - 2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. On-site storage or sale of removed items or materials is not permitted.

## 1.8 COORDINATION

- A. Arrange demolition schedule so as not to interfere with operations of adjacent occupied buildings.

## PART 2 - PRODUCTS

### 2.1 SOIL MATERIALS

- A. Satisfactory Soils: Comply with requirements in **Division 31** Section "**Earthwork**."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting demolition operations.
- B. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
- C. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.
- D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

### 3.2 PREPARATION

- A. Refrigerant: Remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction before starting demolition.
- B. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.
  - 1. Owner will arrange to shut off indicated utilities when requested by Contractor.
  - 2. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.

- C. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
  - 1. Strengthen or add new supports when required during progress of demolition.
- D. Salvaged Items: Comply with the following:
  - 1. Clean salvaged items of dirt and demolition debris.
  - 2. Pack or crate items after cleaning. Identify contents of containers.
  - 3. Store items in a secure area until delivery to Owner.
  - 4. Transport items to storage area designated by Owner.
  - 5. Protect items from damage during transport and storage.

### 3.3 PROTECTION

- A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.
- B. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations.
  - 1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
  - 2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.
    - a. Provide at least 72 hours' notice to occupants of affected buildings if shutdown of service is required during changeover.
- C. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Division 1 Section "Temporary Facilities and Controls."
  - 1. Protect adjacent buildings and facilities from damage due to demolition activities.
  - 2. Protect existing site improvements, appurtenances, and landscaping to remain.
  - 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
  - 4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
  - 5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
  - 6. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
  - 7. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.
- D. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

### 3.4 DEMOLITION, GENERAL

- A. General: Demolish indicated existing buildings and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
  2. Maintain fire watch during and for at least two (2) hours after flame cutting operations.
  3. Maintain adequate ventilation when using cutting torches.
  4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Engineering Surveys: During demolition, perform surveys to detect hazards that may result from building demolition activities.
- C. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
  2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- D. **Explosives:** Use of explosives is **not permitted**.

### 3.5 DEMOLITION BY MECHANICAL MEANS

- A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.
- B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.
- C. Salvage: Items to be salvaged are indicated on Drawings.
- D. Below-Grade Construction: Demolish foundation walls and other below-grade construction.
1. Remove below-grade construction, including basements, foundation walls, and footings, completely.
- E. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.
1. Piping: Disconnect piping at unions, flanges, valves, or fittings.
  2. Wiring Ducts: Disassemble into unit lengths and remove plug-in and disconnecting devices.



### **3.6 SITE RESTORATION**

- A. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements in Division 31 Section "Earthwork."
- B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

### **3.7 REPAIRS**

- A. Promptly repair damage to adjacent buildings caused by demolition operations.

### **3.8 DISPOSAL OF DEMOLISHED MATERIALS**

- A. Remove demolition waste materials from Project site and legally dispose of them in an EPA-approved landfill acceptable to authorities having jurisdiction.
  - 1. Do not allow demolished materials to accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Do not burn demolished materials.

### **3.9 CLEANING**

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

**END OF SECTION**

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## **DIVISIONS 3 thru 25**

Not Used - Refer to Drawings for Removal of Mechanical Equipment

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## **DIVISION 26 – ELECTRICAL**

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|-----------------|-------------------------------|
| Section 26 0500 | Electrical General Provisions |
| Section 26 4119 | Demolition                    |

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## SECTION 03 3000

### CAST-IN-PLACE CONCRETE

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Section includes cast-in-place concrete, formwork, reinforcement, and accessories.
  - 1. Cast-in-place concrete used structurally including but not limited to:
    - a. Slabs on grade, both 2 inch thick "rat slab" to provide a working surface and 4 inch thick finished slab.
    - b. Walls.
    - c. Retaining walls both inside the building and site retaining walls.
    - d. Suspended slabs.
  - 2. Formwork.
  - 3. Reinforcement.
    - a. Reinforcing Bars.
    - b. Steel Wire.
    - c. Welded Wire Fabric.
  - 4. Provide for special concrete floor finish that is stained a minimum of 45 days after concrete is placed.
  - 5. Accessories:
    - a. Water stops
    - b. Under slab vapor barrier.
- C. Grout-cleaned or plastered finishes shall not be permitted or accepted.
- D. Related Sections include the following:
  - 1. Section 03 3300 "Cast-in-Place Architectural Concrete" for general building applications of especially finished formed concrete.
  - 2. Section 03 3543.13 "Polished Concrete Slab Finishing" for system to create exposed concrete floors.

##### 1.2 SUBMITTALS

- A. Product Data: Submit data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others as requested by Architect.
- B. Shop Drawings; Reinforcement: Submit original shop drawings prepared by a registered Professional Engineer for fabrication, bending, and placement of concrete reinforcement. Comply with ACI PRC-315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement. Include special reinforcement required for openings through concrete structures.
- C. Architect's review is for general architectural applications and features only. Design of formwork for structural stability and efficiency is Contractor's responsibility.
- D. Samples: Submit samples of materials as requested by Architect, including names, sources, and descriptions.

- E. Laboratory Test Reports: Submit laboratory test reports for concrete materials and mix design test.
- F. Materials Certificates: Provide materials certificates in lieu of materials laboratory test reports when permitted by Architect. Materials certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with, or exceeds, specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.
- G. Product Data for Special Concrete Floor Finishes:
  - 1. Submit special concrete finishes manufacturer's specifications, test data and other data required for each type of manufactured material and product indicated.
  - 2. Submit special concrete finishes describing products to be provided, giving manufacturer's name, product name, and product line number for the specified material proposed to be provided under this section.
  - 3. Submit special concrete finishes manufacturer's recommended installation procedures; which when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the work.
  - 4. Submit special concrete finishes technical data sheet giving descriptive data, curing time, and application requirements.
    - a. Provide material analysis and generic type.
  - 5. Follow all special concrete finishes published manufacturer's installation instructions.
  - 7. Test Reports: Provide certified test reports, prepared by an independent testing laboratory, confirming compliance with specified performance criteria

### **1.3 QUALITY ASSURANCE**

- A. Codes and Standards: Comply with provisions of following codes, specifications, and standards, except where more stringent requirements are shown or specified:
  - 1. ACI SPEC-301 "Specifications for Structural Concrete for Buildings".
  - 2. ACI CODE-318 "Building Code Requirements for Reinforced Concrete".
  - 3. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice".
- B. Testing Agency: Owner will employ and pay a qualified independent testing agency to perform field quality-control testing services specified in Part 3 of this section. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.

### **1.4 QUALITY ASSURANCE FOR STAINED CONCRETE AND SPECIAL CONCRETE FLOOR FINISHES**

- A. Installer Qualifications:
  - 1. Use an experienced installer and adequate number of skilled workmen who are thoroughly trained and experienced in the necessary craft.
  - 2. The special concrete finish manufacturer for each specified material and process shall certify applicator.
  - 3. Applicator shall be familiar with the specified requirements and the methods needed for proper performance of work of this section
- B. Manufacturer's Certification: Provide letter of certification from concrete finish manufacturer or specialized applicator stating that installer is certified applicator of special concrete finishes, and is familiar with proper procedures and installation requirements required by the manufacturer



- C. Mockups for Stained Concrete and Special Concrete Floor Finishes:
1. At locations selected by the Architect, prepare up to four (4) mockups 4 by 4 feet for review and approval.
  2. Construct mockup using processes and techniques intended for use on permanent work, including curing procedures. Include samples of control, construction, and expansion joints in mockup panels.
  3. Mockup shall be stained and sealed by the individual workers who will actually be performing the work for the Project.
  4. Obtain written approval of the mockup from Architect before start of work.
  5. Retain approved mockup through completion of the work for use as a quality standard for finished work.
  6. Approved mockup may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Protection: NO SATISFACTORY CHEMICAL OR CLEANING PROCEDURE IS AVAILABLE to remove petroleum stains from the concrete surface. PREVENTION IS THEREFORE ESSENTIAL
1. Diaper hydraulic powered equipment to avoid staining of the concrete.
  2. Do not park vehicles on the inside slab. If necessary to complete work, place drop cloths under vehicles at all times.
  3. Do not use pipe cutting machine on the inside floor slab.
  4. Do not place steel on interior slab to avoid rust staining.
- E. Pre-Installation Conference: Conduct conference at project site to comply with requirements in Division 1 Section "Project Management and Coordination".
- F. Delivery, Storage and Handling:
1. Deliver materials in original packages and containers, with seal's unbroken, bearing manufacturer labels indicating brand name and directions for storage, mixing with other components, and application.
  2. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.
  3. Dispense special concrete finish material from factory numbered and sealed containers. Maintain record of container numbers
- G. Refer to section 03 3543.13 "Polished Concrete Slab Finishing" for additional criteria for developing polished concrete slabs, including sample panels, mockups, and surface treatment

## 1.5 PROJECT CONDITIONS

- A. Protection of Footings against Freezing: Cover completed work at footing level with sufficient temporary or permanent cover as required to protect footings and adjacent subgrade against possibility of freezing; maintain cover for time period as necessary.
- B. Surface Protection: Protect adjacent finish materials against spatter during concrete placement.

## 1.6 PROJECT CONDITIONS FOR STAINED CONCRETE

- A. Environmental Conditions for Concrete to Receive Staining: Comply with manufacturers written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting topping performance. Also comply with the following:
1. Maintain an ambient temperature between 50 and 90-degrees F during application and at least 48 hours after application
  2. Protection: Take precautions to avoid damage or contamination of any surfaces near the work zone. Protect completed stain work from moisture or contamination.
  3. Air and Surface Temperatures: Prepare surfaces and apply and cure coatings within air and surface temperature range in accordance with Sealer/Hardener Manufacturer's instructions.
  4. Surface Temperature: Minimum of 5 degrees F above dew point.
  5. Relative Humidity: Not above 85 percent and surface temperature is at least 5 degrees F above dew point.
  6. Limitations: Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting Sealer/Hardener Concrete Floor Finish performance.
  7. Close areas to traffic during floor application and after application, for time period recommended by Sealer/Hardener Concrete Floor Finish Manufacturer.

## 1.7 PROJECT CONDITIONS FOR SPECIAL CONCRETE FLOOR FINISHES

- A. Environmental limitations:
1. Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting topping performance.
  2. Concrete must be cured a minimum of 45 days or as directed by the manufacturer before application of hardening/sealing agent can begin.
  3. Application of hardening/sealing agent shall take place 10 days prior to installation of equipment and substantial completion, thus providing a complete, uninhibited concrete slab for application.

## 1.8 WARRANTY ON SPECIAL CONCRETE FLOOR FINISHES

- A. Sealer/Hardener: Manufacturer's and Certified Applicator's Joint Agreement for Twenty (20) year material warranty and Five (5) year labor warranty.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:
- B. Air Entraining Admixture:
1. "Air-Mix"; Euclid Chemical Co.
  2. "Master Air" Series; Master Builders Solutions.
  3. "Darex AEA" or "Daravair"; W.R. Grace.
- C. Water Reducing Admixture:
1. "WRDA Hycol"; W.R. Grace.

2. "Eucon WR-75"; Euclid Chemical Co.
  3. "MasterPozzolith" series or "MasterPolyheed" series; Master Builders Solutions.
  4. "Plastocrete 160"; Sika Chemical Corp.
- D. Super Plasticizer:
1. "WRDA 19" or "Daracem"; W.R. Grace.
  2. "Sikament"; Sika Chemical Corp.
  3. "Eucon 37"; Euclid Chemical Co.
  4. "MasterRheobuild 1000" or "MasterGlenium" series; Master Builders Solutions.
- E. Water Reducing Non Chloride Accelerator:
1. "Accelguard 80"; Euclid Chemical Co.
  2. "MasterSet AC 534" or "MasterSet FP 20"; Master Builders Solutions.
- F. Water Reducing Non Chloride Retarder:
1. "Edoco 20006"; Edoco Technical Products.
  2. "MasterSet R" series or "MasterSet DELVO" series; Master Builders Solutions.
  3. "Eucon Retarder 75"; Euclid Chemical Co.
  4. "Daratard"; W.R. Grace.
- G. Waterstops
1. Rubber:
    - a. The Burke Co.
    - b. Progress Unlimited.
    - c. Williams Products.
    - d. Edoco Technical Products.
  2. Polyvinyl Chloride:
    - a. AFCO Products.
    - b. The Burke Co.
    - c. Edoco Technical Products.
    - d. W.R. Meadows.
    - e. Schleigel Corp.
    - f. Vinylex Corp
- H. Non-Metallic Grout:
1. "MasterFlow 100"; Master Builders Solutions.
  2. "Duragrout"; L & M Const. Chemical Co.
  3. "Five Star Grout"; U.S. Grout Corp.
  4. "Non Shrink GP Grout" US Spec.
- I. Liquid Curing Compound:
1. Exterior:
    - a. "L & M Cure R-2"; L & M Construction Chemicals, Inc.
    - b. "1200 White"; W. R. Meadows.
    - c. "Maxicure Resin" white, US Spec.
  2. Interior: (verify compatibility with floor finish before applying - use wet cure methods if liquid compounds are not compatible with finish flooring materials)
    - a. "L & M Cure R" or "L & M Cure DR"; L & M Construction Chemicals, Inc.
    - b. "Kurez VOX" or "Kurez DR"; The Euclid Chemical Co.
    - c. "1100 Clear" or "3100 Clear"; W. R. Meadows.
    - d. "Maxcure Resin" clear, US Spec.
- J. Bonding Compound:
1. Polyvinyl Acetate (Interior Only):
    - a. "Euco Weld"; Euclid Chemical Co.
    - b. "Weldcrete"; Larsen Products Corp.
    - c. "Everweld"; L & M Construction Chemicals, Inc.

- d. "Bondcoat", US Spec.
- 2. Acrylic or Styrene Butadiene:
  - a. "Everbond"; L & M Construction Chemicals.
  - b. "Acryl Set"; Master Builders.
  - c. "Acryl 60"; Thoro.
  - d. "Daraweld C"; W.R. Grace Construction Products Division.
  - e. "Acrylcoat" or "Multicoat", US Spec.
- K. Epoxy Adhesive:
  - 1. Hilti Hit RE 500.
  - 2. Simpson Set-XP.
- L. Evaporation Control:
  - 1. "E-Con"; L & M Construction Chemicals, Inc.
  - 2. "Monofilm ER", US Spec.
- M. Leveling and Topping Compound:
  - 1. 'Ardex SD-T' self-drying, self-leveling concrete topping
    - a. Primer: 'Ardex EP 2000 substrate preparation epoxy.
    - b. Color: White or gray depending on reaction with concrete stain material. Color as selected by Architect.
    - c. Design Mix: As recommended by the manufacturer's written instructions.
  - 2. 'Flow-top HD', US Spec
    - a. Primer: 'Maxi-bond 2500'

## 2.2 MATERIALS

- A. Forms:
  - 1. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.
    - a. Overlaid plywood complying with U.S. Product Standard PS-1 "A-C or B-B High Density Overlaid Concrete Form", Class I.
  - 2. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.
  - 3. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.
  - 4. Form Ties: Factory-fabricated, adjustable-length, removable or snapoff metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal. Provide units which will leave no metal closer than 1-1/2 inches to surface.
    - a. Provide ties which, when removed, will leave holes not larger than 1 inch diameter in concrete surface.
- B. Reinforcing Materials:
  - 1. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
  - 2. Steel Wire: ASTM A 106, plain, cold-drawn steel.
  - 3. Welded Wire Fabric: ASTM A 106, welded steel wire fabric.
    - a. Flat.

4. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI specifications.
  - a. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
  - b. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).
5. Weldable Reinforcing Bars: ASTM A 706

C. Concrete:

1. Portland Cement: ASTM C 150, Type II, typical unless noted otherwise.
  - a. Use one brand of cement throughout project, unless otherwise acceptable to Architect.
  - b. Fly Ash: ASTM C 618, Class F.
  - c. Normal Weight Aggregates: ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.
    - 1) For exterior exposed surfaces, do not use fine or coarse aggregates containing spalling-causing deleterious substances.
    - 2) Fine Aggregates shall comply with the following gradations:
 

| <u>Sieve</u> | <u>Percent passing</u> |
|--------------|------------------------|
| 3/8 inch     | 100                    |
| No. 4        | 95 to 100              |
| No. 16       | 50 to 85               |
| No. 50       | 10 to 30               |
| No. 100      | 2 to 10                |
    - 3) Coarse Aggregates shall comply with the following gradations:
 

| <u>Sieve</u> | <u>Percent passing</u>  |
|--------------|---|
| 1-1/2 inch   | 100   |
| 3/4 inch     | 90 to 100   |
| 3/8 inch     | 25 to 55  |
| No. 4        | 0 to 10   |
| No. 8        | 0 to 5  |
| No. 200      | Not to exceed 1.75 percent by weight in the combined coarse and fine aggregate. |
    - 4) Gradation limits: Maximum aggregate size shall not exceed the following requirements.
      - (a) 1/5 narrowest dimension between forms.
      - (b) 1/3 of depth of slabs.
      - (c) 3/4 of minimum clear spacing between reinforcing bars.
  - d. Water: Potable.

D. Admixtures:

1. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
2. Water-Reducing Admixture: ASTM C 494, Type A, and containing not more than 0.1 percent chloride ions.
3. Super Plasticizer: ASTM C 494, Type F or Type G and containing not more than 0.1 percent chloride ions.
4. Water-Reducing, Non-Chloride Accelerator Admixture: ASTM C 494, Type E, and containing not more than 0.1 percent chloride ions.
5. Water-Reducing, Retarding Admixture: ASTM C 494, Type D, and containing not more than 0.1 percent chloride ions.
6. Prohibited Admixtures: Calcium chloride thiocyanates or admixtures containing more than 0.1 percent chloride ions are not permitted.

- E. Accessories:
1. Reglets: Where resilient or elastomeric sheet flashing or bituminous membranes are terminated in reglets, provide reglets of not less than 26 gage galvanized sheet steel. Fill reglet or cover face opening to prevent intrusion of concrete or debris.
  2. Waterstops: Provide flat, dumbbell type or centerbulb type waterstops at construction joints and other joints as indicated. Size to suit joints.
    - a. Rubber Waterstops: Corps of Engineers CRD-C 513.
    - b. Polyvinyl Chloride Waterstops: Corps of Engineers CRD-C 572.
  3. Non-Shrink Grout: Grout shall be prepackaged, non-metallic, non-gaseous. It shall conform to ASTM C 1107 Grade B or C at a fluid, flow cone, consistency. Fluid grout shall attain 6500 psi compressive strength in 28 days.
  4. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.
  5. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
    - a. Waterproof paper.
    - b. Polyethylene film.
    - c. Polyethylene-coated burlap.
  6. Liquid Membrane-Forming Curing Compound: Liquid type membrane-forming curing compound complying with ASTM C 309 Type 2 Class A for exterior.
  7. Bonding Compound: Polyvinyl Acetate (interior only) shall conform to ASTM C 1059 Type 1. Acrylic or styrene butadiene shall conform to ASTM C 1059 Type II.
  8. Epoxy Adhesive: ASTM C 881, two component material suitable for use on dry or damp surfaces. Provide material "Type", "Grade", and "Class" to suit project requirements.
  9. Evaporation Control: Monomolecular film designed to reduce rapid moisture loss during placement, float and finish operation.
- F. Under-Slab Vapor Barrier:
1. Basis of Design: Contract Documents are based on product listed below to establish a standard of quality. Other manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
    - a. Manufacturer: Stego Industries, LLC.
    - b. Product: Stego Wrap Vapor Barrier (15-mil).
  2. Vapor Barrier Properties:
    - a. Permeance of less than 0.01 perms (grains/(ft<sup>2</sup>-hr-inHg) as tested in accordance with ASTM E 1745 Section 7.
    - b. Other performance criteria:
      - 1) Strength: ASTM E 1745 Class A.
      - 2) Thickness: 15 mils minimum
  3. Accessories
    - a. Seam tape: By vapor barrier manufacturer.
    - b. Vapor-proofing mastic: By vapor barrier manufacturer.

## 2.4 MIXES

- A. Proportioning and Design of Mixes:
1. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing.
  2. Submit written reports to Architect and Structural Engineer of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Architect.

- B. Design mixes to provide normal weight concrete with a W/C ratio in paragraph 2.4 E.
- C. Suspended Slabs: Proportion structural concrete mixture as follows:
1. Minimum Compressive Strength: As indicated at 28 days.
  2. Calculated Equilibrium Unit Weight: As indicated, plus or minus 3 lb/cu. ft. as determined by ASTM C 567.
  3. Slump Limit: As indicated on Structural Drawings.
  4. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent and as indicated on structural drawings.
- D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work.
- E. Admixtures:
1. Use water-reducing admixture or high range water-reducing admixture (super plasticizer) in concrete as required for placement and workability.
  2. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F.
  3. Use high-range water-reducing admixture in pumped concrete, concrete for industrial slabs, architectural concrete, parking structure slabs, concrete required to be watertight, and concrete with water/cement ratios below 0.50.
  4. Use air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content as indicated on the structural drawings.
    - a. Concrete structures and slabs exposed to freezing and thawing, deicer chemicals, or subjected to hydraulic pressure:
      - 1) 4.5 percent (moderate exposure); 5.5 percent (severe exposure) 1 1/2 inch maximum aggregate. 4.5 percent (moderate exposure); 6.0 percent (severe exposure) 1 inch maximum aggregate.
      - 2) 5.0 percent (moderate exposure); 6.0 percent (severe exposure) 3/4 inch maximum aggregate.
      - 3) 5.5 percent (moderate exposure); 7.0 percent (severe exposure) 1/2 inch maximum aggregate.
    - b. Other Concrete (not exposed to freezing, thawing, or hydraulic pressure): 2 percent to 4 percent air.
  5. Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions.
  6. Water-Cement Ratio: Provide concrete for following conditions with maximum water-cement (W/C) ratios as follows:
    - a. Subjected to freezing and thawing; W/C 0.50.
    - b. Subjected to deicers/watertight; W/C 0.45.
    - c. Subjected to brackish water, salt spray, or deicers; W/C 0.40.
  7. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as indicated on Structural Drawings.

- F. Concrete Mixing:
1. Job-Site Mixing: Mix materials for concrete in appropriate drum type batch machine mixer. For mixers of one cu. yd., or smaller capacity, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released. For mixers of capacity larger than one cu. yd., increase minimum 1-1/2 minutes of mixing time by 15 seconds for each additional cu. yd., or fraction thereof.
    - a. Provide batch ticket for each batch discharged and used in work, indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.
  2. Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as herein specified.
  3. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.

## 2.5 MIXES - SPECIAL REQUIREMENTS FOR FLOOR SLABS TO RECEIVE SPECIAL FINISH

- A. Provide the following requirements for floor slabs to receive special finishes:
1. Concrete design to be a minimum of 3,000 psi.
  2. No more than 15 percent fly ash or slag to be used as cement replacement. Fly ash darkens concrete.
  3. Water/cement ratio to be in the area of 0.47.
  4. The addition of super plasticizers or water reducers is acceptable to achieve plasticity for placement.
  5. The use of air entrainment admixtures is not recommended. Most cement will entrain air. It is recommended that the total air entrainment, including cement should not exceed 5 percent.
  6. Distribution of aggregate in the concrete mix is critical to the final appearance of the polished concrete. Coordinate concrete pour with polishing contractor to assure proper placement of concrete with desired aggregate mix near the surface of the finished slab. Verify via sample panels and mockups as required in section 03 3543.13.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Coordinate the installation of joint materials and vapor retarders with placement of forms and reinforcing steel.
- B. Preparation: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.
- C. Installation Tolerances:
1. Slabs: Minimum Flatness FF of 30 and Minimum Levelness FL of 25.
  2. Slabs to Receive Special Finish: Minimum Flatness FF of 50 and Minimum Levelness FL of 35.
  3. Walls: Comply with ACI requirements for horizontal, vertical, and story to story tolerances.



## 3.2 ERECTION

- A. Forms: Design, erect, support, brace, and maintain formwork to support vertical and lateral, static, and dynamic loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances complying with ACI 347.
1. Design formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.
  2. Construct forms to sizes, shapes, lines, and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.
  3. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.
  4. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.
  5. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
  6. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.
  7. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed. Retightening forms and bracing after concrete placement is required to eliminate mortar leaks and maintain proper alignment.
  8. Preparation of Form Surfaces:
    - a. Clean re-used forms of concrete matrix residue, repair and patch as required to return forms to acceptable surface condition.
    - b. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.
    - c. Thin form-coating compounds only with thinning agent of type, amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.
    - d. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

### 3.3 INSTALLATION

- A. Reinforcement: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.
1. Avoiding cutting or puncturing vapor barrier during reinforcement placement and concreting operations.
  2. Install under slab vapor barrier at all slab on grade applications.
    - a. Install vapor barrier in accordance with manufacturer's instructions and ASTM E 1643.
      - 1) Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from expected direction of placement whenever possible.
      - 2) Extend vapor barrier over footings and grade beams to a distance acceptable to the Architect or stop at impediments such as dowels and waterstops.
      - 3) Seal vapor barrier to foundation wall or footing using manufacturer's tape or termination bar.
      - 4) Overlap joints 6 inches and seal with manufacturer's tape.
      - 5) Seal all penetrations (including pipes) per manufacturer's instructions.
      - 6) No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
      - 7) Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all sides with tape.
  3. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.
  4. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.
  5. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
  6. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.
- B. Concrete Placement:
1. Apply temporary protective covering to lower 2 feet of finished walls adjacent to poured floor slabs and similar conditions, and guard against spattering during placement.
  2. General: Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete", and as herein specified.
  3. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.
  4. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
  5. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.

- a. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.
  - b. Do not vibrate forms or reinforcing steel.
  - 6. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.
    - a. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
    - b. Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
    - c. Maintain reinforcing in proper position during concrete placement operations.
    - d. Control placement and floating of slab in areas where slab will be polished to assure proper exposure of aggregate in finished floor.
  - 7. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306.1 and as herein specified.
    - a. When air temperature has fallen to or is expected to fall below 40 degrees F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F, and not more than 80 degrees F at point of placement.
    - b. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
    - c. Do not use calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.
  - 8. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
    - a. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees F. Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.
    - b. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
    - c. Fog spray forms, reinforcing steel, and subgrade just before concrete is placed.
    - d. Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.
- C. Special Requirements for Concrete Placement for Floor Slabs to Receive Special Concrete Finish.
- 1. Cutting screeds are recommended to achieve a flat floor.
    - a. Floor Flatness: FF50
    - b. Floor Levelness: FL35

- D. Finish:
1. Rough Form Finish: Formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.
  2. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting, or other similar system. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.
    - a. Smooth Rubbed Finish: Provide smooth rubbed finish to concrete surfaces, which have received smooth form finish treatment, not later than one day after form removal.
      - 1) Moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.
  3. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

- E. Slab Finishes:
1. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile, Portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated.
    - a. After placing slabs, plane surface to tolerances for floor flatness (F ) of 15 and floor levelness (F ) of 13. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set, with stiff brushes, brooms, or rakes.
  2. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo, and as otherwise indicated.
    - a. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both, Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to tolerances of F 18 - F 15. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

3. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system.
    - a. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to tolerances of F 20 - F 17. Grind smooth surface defects which would telegraph through applied floor covering system.
  4. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.
  5. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
    - a. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- F. Finishing for Slabs to Receive Special Concrete Finish:
1. Finishing should be close to the surface, not burn and hard trowel or burn the surface finish.
  2. Finish equipment for at least the final work should be equipped with pans. Plastic can be used, but care should be exercised not to burn the floor or leave plastic film.
  3. Finish equipment should be run in a minimum of three directions (north/south; east/west; northeast/southeast) to prevent waves in the floor.
  4. Care should be exercised to prevent "bird baths" and low spots.
- G. Joints:
1. Construction Joints: Locate and install construction joints as indicated or, if not indicated, locate so as not to impair strength and appearance of the structure, as acceptable to Architect.
  2. Provide keyways at least 1-1/2 inch deep in construction joints in walls, slabs, and between walls and footings; accepted bulkheads designed for this purpose may be used for slabs.
  3. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints, except as otherwise indicated.
  4. Waterstops: Provide waterstops in construction joints as indicated. Install waterstops to form continuous diaphragm in each joint. Make provisions to support and protect exposed waterstops during progress of work. Fabricate field joints in waterstops in accordance with manufacturer's printed instructions.
  5. Isolation Joints in Slabs-on-Ground: Construct isolation joints in slabs-on-ground at points of contact between slabs-on-ground and vertical surfaces, such as column pedestals, foundation walls, grade beams, and elsewhere as indicated.
  6. Contraction (Control) Joints in Slabs-on-Ground: Construct contraction joints in slabs-on-ground to form panels of patterns as shown. Use saw cuts 1/8 inch x 1/4 slab depth or inserts 1/4 inch wide x 1/4 of slab depth, unless otherwise indicated. Cut construction joints in concrete as soon as possible after concrete can take the weight of cutting machine, in order to allow cracks to occur at the contraction joint.
    - a. Form contraction joints by inserting premolded plastic, hardboard or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.

- b. Contraction joints in unexposed floor slabs may be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.
  - 7. If joint pattern not shown, provide joints not exceeding 15 feet in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third-bays).
  - 8. Embedded Items:
    - a. Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto.
    - b. Install reglets to receive top edge of foundation sheet waterproofing, and to receive thru-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, relieving angles, and other conditions.
    - c. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.
- H. Miscellaneous Concrete:
- 1. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.
  - 2. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
  - 3. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.
  - 4. Steel Pan Stairs: Provide concrete fill for steel pan stair treads and landings and associated items. Cast-in safety inserts and accessories as shown on drawings. Screed, tamp, and finish concrete surfaces as scheduled.

### 3.4 CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
  - 1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
  - 2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

- B. Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, or by combinations thereof, as herein specified.
1. Provide moisture curing by following methods.
    - a. Keep concrete surface continuously wet by covering with water.
    - b. Continuous water-fog spray.
    - c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4 inch lap over adjacent absorptive covers.
  2. Provide moisture-cover curing as follows:
    - a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
  3. Provide curing and sealing compound to exposed interior slabs and to exterior slabs, walks, and curbs, as follows:
    - a. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
    - b. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring (such as ceramic or quarry tile, glue-down carpet), painting, and other coatings and finish materials, unless otherwise acceptable to Architect.
  4. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs, and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.
  5. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing method.
  6. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, unless otherwise directed.
- C. Curing for Slabs to Receive Special Concrete Finish:
1. Several methods can be utilized. Consult with the Installer doing the concrete polishing. A chemical cure meeting ACI 309 will require a chemical removal. Use of curing blankets will require chemical cleaning. Minimum cure time per ACI recommendation is 7 days.
  2. Water Cure: Use of blankets, Use blankets equal to 'UltraCure' as manufactured by 'McTech Group'. [www.mctechgroup.com](http://www.mctechgroup.com).
    - a. Clean the surface immediately after the blankets are pulled up using a product equal to 'PreKlean' as manufactured by 'Consolidex'. It is recommended that the 'PreKlean' produce be applied and removed with an auto-scrubber.
    - b. Disposal of removed material must comply with federal and local regulations.

3. Chemical Cure: Use of any ACI 309 cure material is acceptable.
  - a. Removal of cure must be done chemically with a product equal to 'Consilideck Wax and Cure Remover' as manufactured by 'Proso'. Material is to be applied to the surface by spray and allowed to dwell on the surface until the cure begins to break down. Run an auto-scrubber soft brushes applying water over the surface with several passes to agitate the cleaner. Remove with vacuum system on the auto-scrubber.
  - b. Disposal of removed material must comply with federal and local regulations

### **3.5 INSTALLATION OF STAINED CONCRETE & SPECIAL CONCRETE FLOOR FINISH -**

- A. Refer to section 03 3543.13 for additional criteria for polished concrete floor work.
  1. Examine substrates, with certified applicator (installer) present, for conditions affecting performance of Sealer/Hardener Concrete Finish. Correct conditions detrimental to timely and proper work. Do not proceed until unsatisfactory conditions are corrected.
  2. Do not begin installation until substrates have been properly prepared and the floor surfaces are free of construction latents and foreign contaminants that will inhibit penetration of Sealer/Hardener and performance.
  3. If substrate preparation is the responsibility of another installer, notify Owner's Representative of unsatisfactory preparation before proceeding.
- B. Field Quality Control:
  1. Manufacturer's Field Services: Manufacturer's representative must be available to provide technical assistance and guidance for surface preparation and application of Sealer/Hardener Concrete Finish.
  2. Sealer/Hardener Concrete Finish shall be inspected and acceptable to the Architect or the Manufacturer of Sealer/Hardener Concrete Finish. Any area that is found unacceptable shall be repaired by the Certified Applicator as deemed necessary.
- C. Workmanship and Cleaning:
  1. Keep premises clean and free of debris at all times.
  2. Touch-up and restore finish where damaged.
  3. Remove spilled, splashed or splattered finish material from all surfaces, as required.
  4. Do not mar surface finish or item being cleaned. Make necessary repairs to damaged surfaces caused by cleaning operation or installation of Sealer/Hardener Concrete Finish.
  5. Remove debris from Jobsite. Dispose of materials in separate, closed, sealed containers in accordance with local regulations.
- D. Protection:
  1. Protect and prohibit traffic on Sealer/Hardener Concrete Finished Work according to manufacturer's instructions and recommendations.
  2. Barricade areas to protect Ashford Formula spiff coat until properly cured for traffic according to manufacturer's instructions and recommendations.
  3. Refer to Manufacturer for materials used to cover and protect the flooring surfaces. Do not apply any Tape to the floor as it will etch concrete surfaces.



### 3.6 REMOVAL OF FORMS

- A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.
- B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed in less than 14 days and until concrete has attained design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.
- C. Form facing material may be removed 4 days after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.
- D. Re-Use of Forms:
  - 1. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.
  - 2. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.

### 3.7 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect.
  - 1. Cut out honeycomb, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than 1inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.
  - 2. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.
  - 3. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.
  - 4. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

5. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness using a template having required slope.
  6. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01 inch wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.
  7. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.
  8. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Architect.
- B. Repair defective areas, except random cracks and single holes not exceeding 1inch diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
1. Repair isolated random cracks and single holes not over 1 inch in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.
- C. Perform structural repairs with prior approval of Architect or Structural Engineer for method and procedure, using specified epoxy adhesive and mortar.

### 3.8 FIELD QUALITY CONTROL

- A. Sampling and testing for quality control during placement of concrete may include the following, as directed by Architect.
1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
    - a. Slump: As indicated on the Structural Drawings.
    - b. Air Content: As indicated on the Structural Drawings.
    - c. Concrete Temperature: Test hourly when air temperature is 40 degrees F and below, and when 80 degrees F and above; and each time a set of compression test specimens made.
  2. Compression Test Specimen: ASTM C 31; one set of 5 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

3. Compressive Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cubic yards plus additional sets for each 50 cubic yards over and above the first 25 cubic yards of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and two specimens retained in reserve for later testing if required.
  - a. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
  - b. When total quantity of a given class of concrete is less than 50 cubic yards, strength test may be waived by Architect if, in his judgment, adequate evidence of satisfactory strength is provided.
  - c. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
  - d. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.
  
- B. Test results will be reported in writing to Architect, Structural Engineer and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.
  
- C. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
  
- D. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests when unacceptable concrete is verified.

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**DIVISION 03 - CONCRETE**

Section 03 4500

Precast Architectural Concrete

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## SECTION 03 4500

### PRECAST ARCHITECTURAL CONCRETE

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes, but is not limited to, the following:
  - 1. Precast stair treads.
  - 2. Precast parapet caps.
  - 3. Other precast pieces as indicated on the drawings.
- B. Related Sections:
  - 1. Section 05 5000 "Metal Fabrications" for steel stairs to receive precast treads.

##### 1.3 DEFINITIONS

- A. Architectural Precast Concrete: Building units intended to simulate natural cut stone.

##### 1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for precast concrete units.
- B. Shop Drawings: Show fabrication and installation details for precast concrete units. Include dimensions; details of reinforcement and anchorages, if any; and indication of finished faces.
  - 1. Include building elevations showing layout of units and locations of joints and anchors.
- C. Samples: For each color and texture of precast concrete required, 10 inches square in size.
- D. Design Mixes: For each concrete mix.
- E. Qualification Data: For firms and persons specified in Quality Assurance Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

##### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing precast concrete units similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to manufacture required units.
- B. Source Limitations for Architectural Precast Concrete: Obtain precast concrete units through one source from a single manufacturer.

- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Coordinate delivery of precast concrete with unit masonry work to minimize the need for on-site storage and to avoid delaying the Work.
- B. Pack, handle, and ship precast concrete units in suitable packs or pallets.
  - 1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move precast concrete units, if required, using dollies with wood supports.
  - 2. Store precast concrete units on wood skids or pallets with non-staining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.
- C. Store installation materials on elevated platforms, under cover, and in a dry location.
- D. Store mortar aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

## **1.7 PROJECT CONDITIONS**

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
  - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 degrees F and above and will remain so until precast concrete has dried, but not less than 7 days after completing cleaning.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Brailsford Cast Stone, Inc.
  - 2. Eagle Precast.
  - 3. Classic Cast Stone of Dallas, Inc.
  - 4. Continental Cast Stone Manufacturing, Inc.
  - 5. Pineapple Grove Designs.



## 2.2 PRE-CAST CONCRETE MATERIALS

- A. General: Comply with ASTM C 1364 and the following:
  - 1. Portland Cement: ASTM C 150, Type I or Type II, natural color, white, or a blend to produce color indicated, and containing not more than 0.60 percent total alkali when tested according to ASTM C 114.
  - 2. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C 33; gradation as needed to produce required textures.
  - 3. Fine Aggregates: Manufactured or natural sands complying with ASTM C 33, gradation as needed to produce required textures.
    - a. Provide Wyoming white sand or other aggregate as approved by Architect.
  - 4. Coloring: Pure mineral or synthetic pigments, resistant to alkalinity, and used per manufacturer's recommendations
- B. Air-Entraining Admixture: ASTM C 260, certified by the manufacturer to be compatible with other admixtures used.
  - 1. Add to mixes for units exposed to the exterior at manufacturer's prescribed rate to result in an air content of 5 to 7 percent.
- C. Reinforcement: Deformed steel bars complying with ASTM A 615.
  - 1. Epoxy Coating: ASTM A 775.
- D. Embedded Anchors and Other Inserts: Fabricated from stainless steel complying with ASTM A 276 or ASTM A 666, Type 304.
- E. Abrasive Inserts: Silica sand and black epoxy.

## 2.3 PRECAST CONCRETE UNITS

- A. Provide precast concrete units complying with ASTM C 1364.
  - 1. Provide units that are resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666, Procedure A, as modified by ASTM C 1364.
- B. Reinforce units as indicated and as required by ASTM C 1364. Use epoxy-coated reinforcement when covered with less than 1-1/2 inches of material.
- C. Fabricate units with sharp arris and details accurately reproduced with indicated texture on all exposed surfaces, unless otherwise indicated.
  - 1. Abrasive Strip: 2 inches wide, as shown on Drawings.
- D. Cure and finish units as follows:
  - 1. Cure units in totally enclosed curing room under dense fog and water spray at 95 percent relative humidity for 24 hours.
  - 2. Yard cure units until the sum of the mean daily temperatures for each day equals or exceeds 350 degrees F.
  - 3. Acid etch units to remove cement film from surfaces indicated to be finished.
- E. Colors and Textures: As selected by Architect from manufacturer's full range for these characteristics. Submit samples for Architect's approval.
  - 1. Finish all exposed surfaces of precast concrete units to match face-surface finish.
    - a. Finish unexposed surfaces of precast concrete units by float finish.

## **2.4 MORTAR MATERIALS**

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color, white, or a blend to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Mortar Aggregate: ASTM C 144.
  - 1. White-Mortar Aggregates: Natural, white sand or ground, white stone.
- D. Water: Potable.

## **2.5 ACCESSORIES**

- A. Anchors: Type and size indicated, fabricated from stainless steel complying with ASTM A 276 or ASTM A 666, Type 304.
- B. Dowels: Round stainless steel bars complying with ASTM A 276, Type 304, 1/2-inch diameter.
- C. Sealer and Finish: Colorless, slip and stain-resistant penetrating sealer with pH factor between 7 and 8, which does not affect color or physical properties of precast terrazzo surface. Flash point (ASTM D56): 80 degrees F, minimum. Product as recommended by manufacturer and approved by Owner's maintenance staff.

## **2.6 MORTAR MIXES**

- A. Setting Mortar: Comply with ASTM C 270, Proportion Specification, Type S.
  - 1. Limit cementitious materials to Portland cement and lime.
  - 2. Colored-Aggregate Mortar: Produce color required by combining colored aggregates with Portland cement of selected color.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of precast concrete.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. Set precast concrete as indicated on Drawings. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place. Set units accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.

### **3.3 INSTALLATION TOLERANCES**

- A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet or 1/4 inch in 20 feet or more.
- B. Variation from Level: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 3/8 inch maximum.
- C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches or one-fourth of nominal joint width, whichever is less.
- D. Variation in Plane between Adjacent Surfaces (Lipping): Do not exceed 1/16-inch difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

### **3.4 ADJUSTING AND CLEANING**

- A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Precast concrete may be repaired if methods and results are approved by Architect.
- B. Replace units in a manner that results in precast concrete matching approved Samples, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean precast concrete as work progresses. Remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed precast concrete as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
  - 3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
  - 4. Clean precast concrete with proprietary acidic cleaner applied according to manufacturer's written instructions.

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**DIVISION 04 - MASONRY**

Section 04 2223

Unit Masonry Assemblies

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## SECTION 04 2223

### UNIT MASONRY ASSEMBLIES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes unit masonry assemblies consisting of the following:
  - 1. Concrete masonry units (CMU).
  - 2. Decorative concrete masonry units.
  - 3. Mortar and grout.
  - 4. Reinforcing steel.
  - 5. Masonry joint reinforcement.
  - 6. Miscellaneous masonry accessories.
- B. Related Sections include the following:
  - 1. Section 07 6200 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing.
  - 2. Section 07 8400 "Through-Penetration Firestop Systems" for firestopping at tops of masonry walls and at openings in masonry walls.
- C. Products installed, but not furnished, under this Section include the following:
  - 1. Steel lintels and shelf angles for unit masonry, furnished under Division 5 Section "Metal Fabrications."
  - 2. Manufactured reglets in masonry joints for metal flashing, furnished under Division 7 Section "Sheet Metal Flashing and Trim."
  - 3. Hollow-metal frames in unit masonry openings, furnished under Division 8 Section "Steel Doors and Frames."

##### 1.3 DEFINITIONS

- A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

##### 1.4 PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops the following net-area compressive strengths ( $f'_m$ ) at 28 days. Determine compressive strength of masonry by testing masonry prisms according to ASTM C 1314.
  - 1. For Concrete Unit Masonry:  $f'_m = 2500$  psi.

##### 1.5 SUBMITTALS

- A. Product Data: For each different masonry unit, accessory, and other manufactured product specified.
- B. Shop Drawings: Show fabrication and installation details for the following:
  - 1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."

- C. Material Test Reports: From a qualified testing agency indicating and interpreting test results of the following for compliance with requirements indicated:
  - 1. Each type of masonry unit required.
    - a. Include test results, measurements, and calculations establishing net-area compressive strength of masonry units.
  - 2. Mortar complying with property requirements of ASTM C 270.
  - 3. Grout mixes complying with compressive strength requirements of ASTM C 476. Include description of type and proportions of grout ingredients.
  
- D. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
  - 1. Each type of masonry unit required.
    - a. Include test data, measurements, and calculations establishing net-area compressive strength of masonry units.
  - 2. Each cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
  - 3. Each combination of masonry unit type and mortar type. Include statement of net-area compressive strength of masonry units, mortar type, and net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
  - 4. Each material and grade indicated for reinforcing bars.
  - 5. Each type and size of joint reinforcement.
  - 6. Each type and size of anchor, tie, and metal accessory.
  
- E. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

## 1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1093 to conduct the testing indicated, as documented according to ASTM E 548.
  
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.
  
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.
  
- D. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Payment for these services will be made by Owner. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.
  - 1. Concrete Masonry Unit Test: For each concrete masonry unit indicated, per ASTM C 140.
  - 2. Mortar Test: For mortar properties per ASTM C 270.
  - 3. Grout Test: For compressive strength per ASTM C 1019.
  
- E. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.



- F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."
- G. Mockups: Before installing unit masonry, build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
1. Locate mockups in the locations indicated or, if not indicated, as directed by Architect.
  2. Build mockups for the following types of masonry in sizes approximately 48 inches long by 48 inches high by full thickness, including face and backup wythes and accessories. Include a sealant-filled joint at least 16 inches long in each mockup.
    - a. Each type of exposed unit masonry construction.
    - b. Typical exterior wall with lower corner of window opening framed with stone trim at upper corner of mockup. Make opening approximately 12 inches wide by 16 inches high
  3. Clean exposed faces of mockups with masonry cleaner as indicated.
  4. Notify Architect seven days in advance of dates and times when mockups will be constructed.
  5. Protect accepted mockups from the elements with weather-resistant membrane.
  6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  7. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
    - a. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups, unless such deviations are specifically approved by Architect in writing.
  8. Demolish and remove mockups when directed.
  9. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

## 1.8 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work, except when the ambient temperature is expected to remain above 65 degrees F and no rain is forecast for the next 24 hours. (This is to prevent condensation from covered walls causing a moisture problem.) Cover partially completed masonry each day that construction is not in progress. Walls are to be protected until they are permanently protected by the roofing membrane over the cap plate. The General Contractor is to provide temporary protection immediately following the topping out of each section of wall by installing waterproof sheeting over the cap plate until the roofing membrane is installed. A solid grouted top bond beam shall not be considered adequate protection for the wall.
1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
  2. Protection shall remain in place until final weatherproof covering has been installed. Once masonry work has commenced the Contractor shall reimburse the Owner the sum of \$500.00 per day that the masonry work is not protected.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
1. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread on ground and over wall surface.
  2. Protect sills, ledges, and projections from mortar droppings.
  3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
  5. Provide temporary edge on floor slabs to prevent moisture from draining over the edge of the floor slabs and down walls
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements of TMS 602/ACI 530.1/ASCE 6.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 degrees F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.
1. When ambient temperature exceeds 100 degrees F, or 90 degrees F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.

## PART 2 - PRODUCTS

### 2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

### 2.2 CONCRETE MASONRY UNITS

- A. General: Provide shapes indicated and as follows:
1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
  2. At interior walls, provide chamfered units for outside corners, unless otherwise indicated.
- B. Concrete Masonry Units: ASTM C 90-00 and as follows (standard units)
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2500 psi.
  2. Weight Classification: Medium weight. (Minimum weight of 115 lbs per cu. ft.)
  3. Sizes: Manufactured to the following nominal dimensions:
    - a. 8 x 8 x 16, 12 x 8 x 16, 12 x 4 x 16, 10 x 4 x 16, 12 x 4 x 16, 8 x 4 x 16, 10 x 4 x 16, and 10 x 8 x 16 inches.
  4. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.
    - a. Where units are to be left exposed, provide color and texture matching the range represented by Architect's sample.
- C. Decorative Concrete Masonry Units: ASTM C 90-00 and as follows:
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2500 psi.
  2. Weight Classification: Medium weight. (Minimum weight of 115 lbs per cu. ft.)
  3. Size: Manufactured to dimensions indicated for non-decorative units as well as 4 x 4 x 16 and 8 x 4 x 16 inch (nominal) veneer units..
  4. Finish: Exposed faces of the following general description matching color, pattern, and texture in accordance with Finish Schedule at the beginning of Division 9.
    - a. NOTE: See Finish Schedule for colors. Pattern as shown on Drawings.
    - b. Medium-weight aggregate, integral color, split-face finish.
      - 1) Provide units made with aggregate matching aggregate in Architects sample.
    - c. Medium-weight aggregate, integral color, ground finish (Honed).
      - 1) Where indicated, provide units with ground finish (Honed) on both sides. Provide for approval samples consisting of not less than four units, representing the range of color and texture selected by Architect.
      - 2) Provide units without the presence of objectionable imperfections, such as saw or blade marks, based on viewing the face or faces from a distance of not less than 5 ft under optimum lighting conditions.
    - d. Medium-weight aggregate, integral color, smooth finish.
      - 1) Provide units made with aggregate matching aggregate in Architect's sample.

## 2.3 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
- D. Aggregate for Grout: ASTM C 404.
- E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.
  - 1. Provide multiple colors as selected by the Architect. Locate each color where directed by the Architect.
- F. Epoxy Pointing Mortar: ASTM C 395, epoxy resin based material formulated for use as pointing mortar for structural clay tile facing units (and approved for such use by manufacturer of the units); in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's colors
- G. Water: Potable.

## 2.4 REINFORCING STEEL

- A. Uncoated Steel Reinforcing Bars: ASTM A 615 Grade 60.

## 2.5 MASONRY JOINT REINFORCEMENT

- A. General: ASTM A 951 and as follows:
  - 1. Hot-dip galvanized, carbon-steel wire for both interior and exterior walls.
  - 2. Wire Size for Side Rods: W1.7 or 0.148-inch diameter.
  - 3. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter.
  - 4. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units where indicated.
- B. For single-wythe masonry, provide either ladder or truss type with single pair of side rods and cross rods spaced not more than 16 inches o.c.

## 2.6 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Fabricate from the following metal complying with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim" and below:
  - 1. Copper: 10-oz./sq. ft. weight or 0.0135 inch thick for fully concealed flashing; 16-oz./sq. ft. (weight or 0.0216 inch thick elsewhere).
  - 2. Fabricate metal drip edges from sheet metal indicated above. Extend at least 3 inches into wall and 1/2 inch out from wall, with a hemmed outer edge bent down 30 degrees.
  - 3. Stainless steel drip edge (26 gage 204 stainless steel) with preformed corners may be substituted, if approved by Architect.

- B. Contractor's Option for Concealed Flashing: For flashing partly exposed to the exterior, use metal flashing specified above. For flashing not exposed to the exterior, use the one of the following, unless otherwise indicated:
1. Copper-Laminated Flashing: Manufacturer's standard laminated flashing consisting of 5-oz./sq. ft. sheet copper bonded with asphalt between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
  2. Self-Adhering Stainless Steel Flexible Flashing: York 304 or Architect approved equivalent; butyl adhesive on 2 mil type 304 stainless steel sheet.
- C. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by the flashing manufacturer for bonding flashing sheets to each other and to substrates.

## 2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Preformed Control-Joint Gaskets: Styrene-butadiene-rubber compound, ASTM D 2000, Designation M2AA-805, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.
- E. Cavity Drainage Material: Not less than 1-inch- thick, free-draining mesh; made from polyethylene strands and shaped to avoid being clogged by mortar droppings.

## 2.8 MISCELLANEOUS ANCHORS

- A. Anchor Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of diameter and length indicated and in the following configurations:
1. Non-headed bolts, bent in manner indicated.
- B. Postinstalled Anchors: Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
1. Type: Expansion anchors.
  2. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).
  3. For Post-installed Anchors in Concrete: Capability to sustain, without failure, a load equal to four times the loads imposed.
  4. For Post-installed Anchors in Grouted Masonry Units: Capability to sustain, without failure, a load equal to six times the loads imposed.

## 2.9 MASONRY CLEANERS

- A. Job-Mixed Detergent Solution: Solution of 1/2-cup dry measure tetrasodium polyphosphate and 1/2-cup dry measure laundry detergent dissolved in 1 gallon of water.

## 2.10 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
  - 1. Do not use calcium chloride in mortar or grout. Delete subparagraph below if cold-weather admixture is not retained.
- B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification, as indicated on the structural drawings.
- C. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required. Limit pigments to the following percentages of cement content by weight:
  - 1. For mineral-oxide pigments and Portland cement-lime mortar, not more than 10 percent.
- D. Grout for Unit Masonry: Comply with ASTM C 476, type as indicated on the structural drawings.
- E. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's directions.
- F. Contractor to provide **custom colored** mortar and grout for each color of block specified.

## 2.11 SOURCE QUALITY CONTROL

- A. Owner will engage a qualified independent testing agency to perform source quality-control testing indicated below:
  - 1. Payment for these services will be made by Owner.
  - 2. Re-testing of materials failing to meet specified requirements shall be done at Contractor's expense.
- B. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to ASTM C 140.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
  - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
  - 2. Verify that substrates are within tolerances specified.
  - 3. Verify that reinforcing dowels are properly placed.
  - 4. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Before installation, examine rough-in and built-in construction to verify actual locations of

pipng connections.

### **3.2 INSTALLATION, GENERAL**

- A. Thickness: Build single-wythe walls to the actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.
- D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction. Where possible, use full-size units without cutting. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
  - 1. Mix units from several pallets or cubes as they are placed.
- F. Wetting of Masonry: Wet masonry before laying if the initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at the time of laying.
- G. Cover sheathing with infiltration barrier as follows:
  - 1. Install in accordance with Manufacturer's instructions over exterior sheathing. Seal joints and penetrations through air infiltration barrier with specified tape prior to installation of finish material. Air infiltration barrier shall be air tight and free from holes, tears, and punctures. All window and door penetrations shall be taped.
  - 2. Apply infiltration barrier to cover upstanding flashing with 4-inch overlap.

### **3.3 CONSTRUCTION TOLERANCES**

- A. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:
  - 1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/4 inch in 20 feet, nor 1/2 inch maximum.
  - 2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, nor 1/2 inch maximum.
  - 3. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than 1/4 inch in 20 feet, nor 1/2 inch maximum.
  - 4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.

### **3.4 LAYING MASONRY WALLS**

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where

possible, at other locations.

- B. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
  - 1. One-half running bond with vertical joint in each course centered on units in courses above and below.
  - 2. Soldier coursing with units laid vertically (where shown on Drawings).
- C. Lay concealed masonry with all units in a wythe in running bond. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.
- F. Fill space between hollow-metal frames and masonry solidly with mortar, unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
- H. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
  - 1. Install compressible filler in joint between top of partition and underside of structure above.
  - 2. At fire-rated partitions, install firestopping in joint between top of partition and underside of structure above to comply with Division 7 Section "Firestopping."



### **3.5 MORTAR BEDDING AND JOINTING**

- A. Lay hollow masonry units as follows:
  - 1. With full mortar coverage on horizontal and vertical face shells.
  - 2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
  - 3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
- B. Joints: Tooled

### **3.6 MASONRY JOINT REINFORCEMENT**

- A. General: Provide continuous masonry joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
  - 1. Space reinforcement not more than 16 inches o.c.
  - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
  - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.
    - a. Reinforcement above is in addition to continuous reinforcement.
- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

### **3.7 CONTROL AND EXPANSION JOINTS**

- A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.
- B. Form control joints in concrete masonry as follows:
  - 1. Install preformed control-joint gaskets designed to fit standard sash block.
- C. Build in horizontal, pressure-relieving joints where indicated; construct joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 7 Section "Joint Sealants."
  - 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.

### **3.8 LINTELS**

- A. Install steel lintels where indicated.
- B. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

### 3.9 FLASHING, WEEP HOLES, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Unless otherwise indicated, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
- C. Install flashing as follows:
  - 1. At masonry-veneer walls, extend flashing from exterior face of veneer, through veneer, up face of sheathing at least 8 inches, and behind air-infiltration barrier or building paper.
  - 2. At lintels and shelf angles, extend flashing a minimum of 4 inches into masonry at each end. At heads and sills, extend flashing 4 inches at ends and turn flashing up not less than 2 inches to form a pan.
  - 3. Extend sheet metal flashing 1/2 inch beyond face of masonry at exterior and turn flashing down to form a drip.
- D. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing and as follows:
  - 1. Use round plastic tubing to form weep holes.
  - 2. Space weep holes formed from plastic tubing 48 inches o.c.

### 3.10 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.
  - 1. Construct formwork to conform to shape, line, and dimensions shown. Make it sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
  - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements of ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
  - 1. Comply with requirements of ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

### 3.11 FIELD QUALITY CONTROL

- A. Owner will engage a qualified independent testing agency to perform field quality-control testing indicated below.
  - 1. Payment for these services will be made by Owner.
  - 2. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.
- B. Testing Frequency: Tests and Evaluations listed in this Article will be performed during construction for each 5000 sq. ft. of wall area or portion thereof.

- C. Mortar properties will be tested per ASTM C 780. Test mortar for mortar air content, water-repellent admixture and compressive strength.
- D. Grout will be sampled and tested for compressive strength per ASTM C 1019.
- E. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to ASTM C 140.

### **3.12 REPAIRING, POINTING, AND CLEANING**

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
  - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
  - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clear water.
  - 5. Clean brick by the bucket-and-brush hand-cleaning method described in BIA Technical Notes No. 20, using job-mixed detergent solution.

### **3.13 MASONRY WASTE DISPOSAL**

- A. Excess Masonry Waste: Remove excess masonry waste and legally dispose of off Owner's property.

**END OF SECTION**

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**DIVISION 05 - METALS**

Section 05 4000

Cold-Formed Metal Framing

Section 05 5000

Metal Fabrication

Section 05 5213.13

Exterior Stainless Steel Pipe and Tube  
Railings

Section 05 7300

Ornamental Handrails & Railings

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## SECTION 05 2100

### STEEL JOISTS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  1. K-series steel joists
  2. LH-series long-span steel joists.
  3. DLH-series deep long-span steel joists.
  4. Joist accessories.

##### 1.3 DEFINITIONS

- A. SJI "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."
- B. Special Joists: Joists requiring modification by the manufacturer to support non-uniform, unequal, or special loading conditions that invalidate SJI's "Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders."

##### 1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide special joists and connections capable of withstanding design loads within limits and under conditions indicated.
- B. Design joists to withstand design loads with total load deflections no greater than the following:
  1. Roof Joists: Vertical deflection Live Load= $L/360$ , Total Load= $L/240$ , or as indicated on the Structural Drawings.

##### 1.5 SUBMITTALS

- A. Product Data: For each type of joist, accessory, and product indicated.
- B. Shop Drawings: Show layout, mark, number, type, location, and spacings of joists. Include joining and anchorage details, bracing, bridging, accessories; splice and connection locations and details; and attachments to other construction.
  1. Indicate locations and details of anchorage devices and bearing plates to be embedded in other construction.
  2. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.
- D. Welding Certificates: Copies of certificates for welding procedures and personnel.
- E. Mill Certificates: Provide mill certificates signed by manufacturers of bolts certifying that

their products comply with specified requirements.

- F. **Qualification Data:** For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

## 1.6 QUALITY ASSURANCE

- A. **Manufacturer Qualifications:** A firm experienced in manufacturing joists similar to those indicated for this Project and with a record of successful in-service performance.
  1. Manufacturer must be certified by SJI to manufacture joists complying with SJI standard specifications and load tables.
  2. Manufacturer assumes responsibility for engineering special joists to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
  3. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of joists that are similar to those indicated for this Project in material, design, and extent.
- B. **SJI Specifications:** Comply with SJI's "Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders" (hereafter, "Specifications"), applicable to types of joists indicated.
- C. **Welding:** Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel"; and AWS D1.3 "Structural Welding Code--Sheet Steel."

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. **Deliver, store, and handle joists** as recommended in SJI's "Specifications."
- B. **Protect joists from corrosion, deformation, and other damage** during delivery, storage, and handling.

## 1.8 SEQUENCING

- A. **Deliver steel bearing plates** and other devices to be built into concrete and masonry construction.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. **Recycled Content of Steel Products:** Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. **Steel:** Comply with SJI's "Specifications" for chord and web members.
- C. **Steel Bearing Plates:** ASTM A 36/A 36M.



- D. **Carbon-Steel Bolts and Threaded Fasteners:** ASTM A 307, Grade A, carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.
  - 1. Finish: Plain, uncoated.
- E. **High-Strength Bolts and Nuts:** ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.
  - 1. Finish: Plain, uncoated.
- F. **Welding Electrodes:** Comply with AWS standards.
- G. **Galvanizing Repair Paint:** SSPC-Paint 20 or DOD-P-21035.

## 2.2 PRIMERS

- A. **Primer:** Gray or white, fast-curing, lead- and chromate-free, universal modified-alkyd primer with good resistance to normal atmospheric corrosion, complying with performance requirements in FS TT-P-664.

## 2.3 K-SERIES STEEL JOISTS

- A. **Manufacture steel joists** according to "Standard Specifications for Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as follows:
  - 1. Joist Type: K-series steel joists.
  - 2. End Arrangement: Underslung.
  - 3. Top-Chord Arrangement:
    - a. Flat (typical)
- B. **Comply with AWS** requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.
- C. **Provide holes in chord members** for connecting and securing other construction to joists.
- D. **Camber steel joists** according to SJI's "Specifications."
- E. **Equip bearing ends** of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

## 2.4 LONG-SPAN STEEL JOISTS

- A. **Manufacture steel joists** according to "Standard Specifications for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series," in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as follows:
  - 1. Joist Type: LH-series steel joists and DLH-series steel joists.
  - 2. End Arrangement: Underslung.
  - 3. Top-Chord Arrangement:
    - a. Flat (typical)
    - b. Double pitched (above Multi-Purpose Room)
- B. **Comply with AWS** requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.

- C. **Provide holes in chord members** for connecting and securing other construction to joists.
- D. **Camber long-span steel joists** according to SJI's "Specifications."
- E. **Equip bearing ends** of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

## 2.5 JOIST ACCESSORIES

- A. **Bridging:** Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span.
  - 1. Furnish additional erection bridging if required.
- B. **Bearing Plates:** Fabricate steel bearing plates with integral anchorages of sizes and thicknesses indicated. Shop prime paint.
- C. **Ceiling Extensions:** Supply ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface, unless otherwise indicated.
- D. **Miscellaneous Accessories:** Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

## 2.6 CLEANING AND SHOP PAINTING

- A. **Clean and remove loose scale**, heavy rust, and other foreign materials from fabricated joists and accessories to be primed by power-tool cleaning, SSPC-SP 3.
- B. **Apply one shop coat of primer** to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.
  - 1. Refer to Division 9 Section "Painting" for specific primer required on identified steel items.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. **Examine supporting substrates**, embedded bearing plates, and abutting structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. **Proceed with installation** only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. **Do not install joists** until supporting construction is in place and secured.
- B. **Install joists and accessories plumb, square, and true to line;** securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.
  - 1. Before installation, splice joists delivered to Project site in more than one piece.

2. Space, adjust, and align joists accurately in location before permanently fastening.
  3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
  4. Do not rigidly connect bottom chords to columns.
- C. **Field weld joists to supporting steel bearing plates.** Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. **Bolt joists to supporting steel framework** using high-strength structural bolts, unless otherwise indicated. Comply with RCSC's "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.
- E. **Install and connect temporary bridging** concurrently with joist erection, before construction loads are applied.
1. Bridging is to be removed after erection at certain exposed ceilings. Coordinate with the drawings and the Architect and the Structural Engineer where this is to occur.
  2. Bridging shall be designed and erected as required to not interfere with mechanical ductwork that occurs between and parallel to joists. Coordinate with the Architectural, Mechanical, and Structural Drawings.
  3. Coordinate bridging locations so as not to interfere with skylights.

### 3.3 FIELD QUALITY CONTROL

- A. **Testing Agency:** Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. **Field welds** will be visually inspected according to AWS D1.1/D1.1M.
- C. **In addition to visual inspection**, field welds will be tested according to AWS D1.1/D1.1M and the following procedures, as applicable:
1. Radiographic Testing: ASTM E 94 and ASTM E 142.
  2. Magnetic Particle Inspection: ASTM E 709.
  3. Ultrasonic Testing: ASTM E 164.
  4. Liquid Penetrant Inspection: ASTM E 165.
- D. **Bolted connections** will be visually inspected.
1. High-strength, field-bolted connections will be tested and verified according to procedures in RCSC's "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts."
- E. **Correct deficiencies** in Work that inspections and test reports have indicated are not in compliance with specified requirements.
- F. **Additional testing** will be performed to determine compliance of corrected Work with specified requirements.

### 3.4 REPAIRS AND PROTECTION

- A. **Touchup Painting:** After installation, promptly clean, prepare, and prime or reprime

field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates and abutting structural steel.

1. Clean and prepare surfaces by power-tool cleaning, SSPC-SP 3.
2. Apply a compatible primer of the same type as the shop primer used on adjacent surfaces.

- B. **Provide final protection** and maintain conditions in a manner acceptable to manufacturer and Installer, which ensure joists and accessories are without damage or deterioration at time of Substantial Completion.

**END OF SECTION**

## SECTION 05 3100

### STEEL DECKING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Roof deck.
  - 2. Composite floor deck.
  - 3. Method of attachment to structure as approved by Architect and Structural Engineer.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Sustainability Submittals:
  - 1. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- C. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction. Method of attachment to structure shall be described.
- D. Product Certificates: Signed by steel deck manufacturers certifying that products furnished comply with requirements.
- E. Welding Certificates: Copies of certificates for welding procedures and personnel.
- F. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:
  - 1. Mechanical fasteners.
- G. Evaluation Reports: For steel deck.
- H. Field quality-control reports

##### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed steel deck similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

- C. **Fire-Test-Response Characteristics:** Where indicated, provide steel deck units identical to those steel deck units tested for fire resistance per ASTM E 119 by a testing and inspection agency acceptable to authorities having jurisdiction.
  - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
  - 2. Markings: Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.
- D. **AISI Specifications:** Calculate structural characteristics of steel deck according to AISI's "Specification for the Design of Cold-Formed Steel Structural Members."
- E. **FM Listing:** Provide steel roof deck evaluated by FM and listed in FM's "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

## 1.5 PRE-INSTALLATION MEETING

- A. Installer shall demonstrate workmanship by conducting representative fastenings and welds at pre-installation meeting subject to guidance from mechanical fastener manufacturer and approval of the Structural Engineer.
- B. Mechanical fastener manufacturer's direct representative shall instruct installer and inspector on proper evaluation of installed fasteners.
- C. In areas where underside of deck will be exposed to view, written approval of the Architect is required.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. **Protect steel deck** from corrosion, deformation, and other damage during delivery, storage and handling.
- B. **Stack steel deck** on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. **Recycled Content of Steel Products:** Postconsumer recycled content plus one-half of preconsumer recycled content **not less than 25 percent**.

### 2.2 MANUFACTURERS

- A. **Available Manufacturers:** Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. ASC Profiles, Inc., a BlueScope Steel Company.
  - 2. Consolidated Systems, Inc.; Metal Dek Group.
  - 3. Nucor Corp.; Vulcraft Group.
  - 4. Roof Deck, Inc.
  - 5. Verco Manufacturing Co.

### 2.3 ROOF DECK

- A. **Steel Roof Deck:** Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 29, and the following:
1. Prime-Painted Steel Sheet: ASTM A 1008, Grade 50 minimum, shop primed with white or gray baked-on, lead- and chromate-free rust-inhibitive primer complying with performance requirements of FS TT-P-664.
  2. Deck Profile: Type B and Type N and as indicated on the Structural Drawings.
  3. Profile Depth: 1 1/2 inches and 3 inches and as indicated on the Structural Drawings.
  4. Design Uncoated-Steel Thickness: Per plan.
  5. Span Condition: Triple span or more as indicated.
    - a. contractor may use less than triple span provided the supplier or supplier's engineer submits evidence of deck capability for supporting load under double, single or cantilevered condition.
  6. Side Laps: interlocking seam

## 2.4 COMPOSITE FLOOR DECK

- A. **Composite Steel Floor Deck:** Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 29, the minimum section properties indicated, and the following:
1. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M or ASTM A1063, Structural Steel (SS), Grade 50, G60 (Z180) zinc coating; with unpainted top and bottom surface cleaned, pretreated, and primed with manufacturer's baked-on, lead- and chromate-free rust-inhibitive primer complying with performance requirements of FS TT-P-664
  2. Deck Profile: Type W3 Composite.
  3. Profile Depth: 3 inches and as scheduled.
  4. Design Uncoated-Steel Thickness: Per plan.
  5. Span Condition: Triple span or more as indicated
    - a. contractor may use less than triple span provided the supplier or supplier's engineer submits evidence of deck capability for supporting load under double, single or cantilevered condition. This may include plans for shored construction procedures.

## 2.5 ACCESSORIES

- A. **General:** Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. **Side-Lap Fasteners:** As indicated on the structural drawings.
- C. **Rib Closure Strips:** Vulcanized, closed-cell, synthetic rubber.
- D. **Miscellaneous Sheet Metal Deck Accessories:** Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- E. **Pour Stops and Girder Fillers:** Steel sheet, minimum yield strength of 50,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 29 for overhang and slab depth.
- F. **Column Closures, End Closures, Z-Closures, and Cover Plates:** Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

- G. **Weld Washers:** Uncoated steel sheet, shaped to fit deck rib, 0.0747 inch thick, with factory-punched hole of 3/8-inch minimum diameter.
- H. **Recessed Sump Pans:** Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch- wide flanges and level recessed pans of 1-1/2- inch minimum depth. For drains, cut holes in the field.
- I. **Shear Connectors:** ASTM A 108, Grades 1010 through 1020 headed stud type, cold-finished carbon steel, AWS D1.1, Type B, with arc shields.
- J. **Galvanizing Repair Paint:** SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight
- K. **Repair Paint:** Lead- and chromate-free rust-inhibitive primer complying with performance requirements of FS TT-P-664.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. **Examine supporting frame** and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

### **3.2 INSTALLATION, GENERAL**

- A. **Install deck panels** and accessories according to applicable specifications and commentary in SDI Publication No. 29, manufacturer's written instructions, and requirements in this Section.
- B. **Install temporary shoring** before placing deck panels, if required to meet deflection limitations.
- C. **Locate decking bundles** to prevent overloading of supporting members.
- D. **Place deck panels** on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
  - 1. Align cellular deck panels for entire length of cell runs and align cells at ends of abutting panels.
- E. **Place deck panels flat** and square and fasten to supporting frame without warp or deflection.
- F. **Cut and neatly fit deck panels** and accessories around openings and other work projecting through or adjacent to decking.
- G. **Provide additional reinforcement** and closure pieces at openings as required for strength, continuity of decking, and support of other work.
- H. **Comply with AWS requirements** and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. **Mechanical fasteners** may be used in lieu of welding to fasten deck in locations accepted



and approved by the Architect. Locate mechanical fasteners and install according to deck manufacturer's written instructions and in accordance with the Steel Deck Attachment Schedule in the Structural Drawings.

- J. **Wet Construction Conditions:** Under no circumstances shall fastening of deck to structure be allowed in wet or moist conditions.

### 3.3 ROOF DECK INSTALLATION

- A. **General:** Roof deck shall be tight to supporting steel framing. Fasten roof deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter, but not less than 1-1/2 inches (38 mm) long, and as follows unless otherwise indicated on structural drawings:
1. Weld Diameter: 3/4 inch, nominal.
  2. Weld Spacing: Weld edge and interior ribs at locations and spacings as indicated on the drawings.
- B. **Mechanical fasteners** may be used in lieu of welding to fasten deck in locations accepted and approved by Architect and Structural Engineer. Locate mechanical fasteners and install according to deck manufacturer's written instructions.
- C. **Side-Lap and Perimeter Edge Fastening:** Fasten side laps and perimeter edges of panels between supports, at intervals as indicated on the drawings.
- D. **End Bearing:** Install deck ends over supporting frame with a minimum end bearing of 2 inches, with end joints as follows:
1. End Joints: Lapped 2 inches minimum.
- E. **Roof Sump Pans and Sump Plates:** Install over openings provided in roof decking and weld flanges to top of deck. Space welds not more than 12 inches apart with at least 1 weld at each corner.
- F. **Miscellaneous Roof Deck Accessories:** Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.
- G. **Flexible Closure Strips:** Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

### 3.4 FLOOR DECK INSTALLATION

- A. **Fasten floor deck panels** to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
1. Weld Diameter: 3/4 inch, nominal.
  2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds at 12 inches apart.
  3. Weld Spacing: Space and locate welds as indicated or as recommended by manufacturer.
- B. **Side-Lap and Perimeter Edge Fastening:** Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 36 inches, and as follows.
1. Mechanically fasten with self-drilling No. 10 (4.8-mm-) diameter or larger

carbon-steel screws or fasten with a button punch.

- C. **End Bearing:** Install deck ends over supporting frame with a minimum end bearing of 2 inches, with end joints as follows.
  - 1. Mechanically fasten with self-drilling No. 10 (4.8-mm-) diameter or larger carbon-steel screws or fasten with a button punch.
- D. **Shear Connectors:** Weld shear connectors through deck to supporting frame according to AWS D1.1 and manufacturer's written instructions. Butt end joints of deck panels; do not overlap. Remove and discard arc shields after welding shear connectors.
- E. **Pour Stops and Girder Fillers:** Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.
- F. **Floor Deck Closures:** Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of decking. Weld cover plates at changes in direction of floor deck panels, unless otherwise indicated.

### 3.5 FIELD QUALITY CONTROL

- A. **Testing:** Owner will engage a qualified independent testing agency to perform field quality-control testing.
- B. **Field welds** will be subject to inspection. Examination and qualification of puddle welds and fillet welds shall be in accordance with AWS D1.3 criteria. Ensure deck is clamped to the supporting steel framing.
- C. **Mechanical Fasteners:** Examine fastener placement location and washer condition. Ensure steel deck is tight and clamped to the supporting steel framing.
- D. **Shear connector stud welds** will be inspected and tested according to AWS D1.1 for stud welding and as follows:
  - 1. Shear connector stud welds will be visually inspected.
  - 2. Bend tests will be performed if visual inspections reveal less than a full 360-degree flash or welding repairs to any shear connector stud.
  - 3. Tests will be conducted on additional shear connector studs if weld fracture occurs on shear connector studs already tested according to AWS D1.1.
- E. **Testing agency** will report test results promptly and in writing to Contractor and Architect.
- F. **Remove and replace work** that does not comply with specified requirements.
- G. **Additional testing and inspecting**, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

### 3.6 REPAIRS AND PROTECTION

- A. **Repair Painting:** Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
  - 1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
- B. **Provide final protection** and maintain conditions to ensure that steel deck is without

damage or deterioration at time of Substantial Completion.

**END OF SECTION**

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**DIVISIONS 06 - 48**

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## SECTION 05 4000

### COLD-FORMED METAL FRAMING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Exterior non-load-bearing wall framing.
  - 2. Sill sealer for exterior steel stud walls
- B. Related Sections include the following:
  - 1. Section 05 5000 "Metal Fabrications" for masonry shelf angles and connections.
  - 2. Section 09 2216 "Non-Structural Metal Framing" for interior non-load-bearing metal-stud framing and ceiling-suspension assemblies.

##### 1.3 DEFINITIONS

- A. Minimum Un-coated Steel Thickness: Minimum un-coated thickness of cold-formed framing delivered to the Project site shall be not less than 95 percent of the thickness used in the cold-formed framing design. Lesser thicknesses shall be permitted at bends due to cold forming.
- B. Producer: Entity that produces steel sheet coil fabricated into cold-formed members.

##### 1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
  - 1. Design Loads: As indicated.
  - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
    - a. Exterior Non-Load-Bearing Curtain-Wall Framing: Horizontal deflection of 1/240 of the wall height.
  - 3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 degrees F.
  - 4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure.
- B. Design exterior non-load-bearing curtain-wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

## 1.5 SUBMITTALS

- A. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining Work.
  - 1. Delegated-Design Submittal: For cold-formed steel framing.
  - 2. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer, licensed in the State where the building is located, responsible for their preparation.
- C. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:
  - 1. Expansion anchors.
  - 2. Power-actuated anchors.
  - 3. Mechanical fasteners.
  - 4. Vertical deflection clips.
  - 5. Miscellaneous structural clips and accessories.
- D. Research Reports: For non-standard cold-formed steel framing, from ICC-ES.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Engineering Responsibility: Engage a qualified professional engineer licensed, in the State where the building is located, to prepare design calculations, Shop Drawings, and other structural data.
- C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3/D1.3M, "Structural Welding Code--Sheet Steel."
- D. Fire-Test-Response Characteristics: Where metal framing is part of a fire-resistance-rated assembly, provide framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Fire-Resistance Ratings: Indicated by GA File Numbers in GA-600, "Fire Resistance Design Manual," or by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
- E. AISI Specifications: Comply with AISI's "Specification for the Design of Cold-Formed Steel Structural Members" for calculating structural characteristics of cold-formed metal framing.



## **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Studco Building Systems, Inc.
  - 2. CEMCO (California Expanded Metal Products Co.)
  - 3. ClarkDietrich Industries, Inc.
  - 4. SCAFCO Corp.

### **2.2 MATERIALS**

- A. Steel Sheet: ASTM A 570/A 570M, hot rolled or ASTM A 611, cold rolled; cleaned, pretreated, and primed with manufacturer's baked-on, lead- and chromate-free, rust-inhibitive primer complying with performance requirements in FS TT-P-664, of grade as indicated on Structural Drawings, but not less than Grade 33 (230).

### **2.3 NON-LOAD-BEARING WALL FRAMING**

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, complying with ASTM C 955, and as follows unless otherwise indicated on the structural drawings:
  - 1. Minimum Uncoated-Steel Thickness: As indicated on the Structural Drawings.
  - 2. Flange Width: 1-5/8 inches.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, complying with ASTM C 955, and as follows unless otherwise indicated on the structural drawings:
  - 1. Minimum Uncoated-Steel Thickness: As indicated on the Structural Drawings.
  - 2. Flange Width: 1-1/4 inches.
- C. Vertical Deflection Clips: Manufacturer's standard clips, capable of accommodating upward and downward vertical displacement of primary structure.

### **2.4 FRAMING ACCESSORIES**

- A. Fabricate steel-framing accessories of the same material and finish used for framing members, with a minimum yield strength of 33,000 psi.

- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
1. Supplementary framing.
  2. Bracing, bridging, and solid blocking.
  3. Web stiffeners.
  4. End clips.
  5. Foundation clips.
  6. Gusset plates.
  7. Stud kickers, knee braces, and girts.
  8. Hole reinforcing plates.
  9. Backer plates.

## 2.5 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36, zinc coated by hot-dip process according to ASTM A 123.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel headless, hooked, bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153, Class C.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- E. Mechanical Fasteners: Corrosion-resistant-coated, self-drilling, self-threading steel drill screws.
1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

## 2.6 MISCELLANEOUS MATERIALS

- A. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, non-corrosive, non-staining grout containing selected silica sands, Portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.
- B. Sill Sealer for Exterior Steel Stud Walls:
1. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
    - a. Manufacturer: Protecto Wrap Company.
    - b. Product: Premium Energy Sill Sealer® with manufacturer's recommended primer.
  2. Properties: 3/8 inch closed cell polyethylene foam with self-adhesive waterproofing membrane.

## **2.7 FABRICATION**

- A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.
  - 1. Fabricate framing assemblies using jigs or templates.
  - 2. Cut framing members by sawing or shearing; do not torch cut.
  - 3. Fasten cold-formed metal framing members by welding. Wire tying of framing members is not permitted. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
  - 4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
  - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
  - 2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Grout bearing surfaces uniform and level to ensure full contact of bearing flanges or track webs on supporting concrete or masonry construction.

### **3.3 INSTALLATION, GENERAL**

- A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed metal framing according to ASTM C 1007, unless more stringent requirements are indicated.
- C. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.
  - 1. Cut framing members by sawing or shearing; do not torch cut.
  - 2. Fasten cold-formed metal framing members by welding. Wire tying of framing members is not permitted.
    - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

- D. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.
- E. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- F. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.
- G. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work. Coordinate with Division 7 Section "Building Insulation."
- H. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.
- I. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
  - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

### **3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION**

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Install sill sealer as per manufacturer's written instructions
- C. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:
  - 1. Stud Spacing: Not more than 16 inches.
- D. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- E. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
  - 1. Connect vertical deflection clips to bypassing/infill studs and anchor to primary building structure.
- F. Install horizontal bridging in curtain-wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
  - 1. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
- G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable curtain-wall-framing system.

### **3.5 REPAIRS AND PROTECTION**

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: Wire brush, clean, and paint scarred areas, welds, and rust spots on fabricated and installed prime-painted, cold-formed metal framing. Paint framing surfaces with same type of shop paint used on adjacent surfaces.
- C. Protect cutouts, corners, and joints in sheathing by filling with a flexible sealant or by applying tape recommended by sheathing manufacturer at time sheathing is applied.
- D. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, which ensure cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

**END OF SECTION**

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## SECTION 05 4200

### COLD-FORMED METAL FRAMING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Exterior non-load-bearing wall framing.
  - 2. Sill sealer for exterior steel stud walls
- B. Related Sections include the following:
  - 1. Section 05 5000 "Metal Fabrications" for masonry shelf angles and connections.
  - 2. Section 09 2200 "Non-Structural Metal Framing" for interior non-load-bearing metal-stud framing and ceiling-suspension assemblies.

##### 1.3 DEFINITIONS

- A. Minimum Un-coated Steel Thickness: Minimum un-coated thickness of cold-formed framing delivered to the Project site shall be not less than 95 percent of the thickness used in the cold-formed framing design. Lesser thicknesses shall be permitted at bends due to cold forming.
- B. Producer: Entity that produces steel sheet coil fabricated into cold-formed members.

##### 1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed metal framing for building exterior as shown in the structural drawings. Interior cold-formed metal framing shall be provided as shown in the architectural drawings.
- B. Variations: Alterations of geometries, materials and connection details for cold-formed metal framing are permitted but must be engineered by a professional engineer holding a Utah Professional Engineer's License. Said engineering is the responsibility of the contractor and the contractor must submit proposed design changes, along with supporting calculations to the architect and engineer of record for review and approval.

##### 1.5 SUBMITTALS

- A. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining Work.

- C. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:
  - 1. Expansion anchors.
  - 2. Power-actuated anchors.
  - 3. Mechanical fasteners.
  - 4. Vertical deflection clips.
  - 5. Miscellaneous structural clips and accessories.

## **1.6 QUALITY ASSURANCE**

- A. Installer Qualifications: An experienced installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- C. Fire-Test-Response Characteristics: Where metal framing is part of a fire-resistance-rated assembly, provide framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Fire-Resistance Ratings: Indicated by GA File Numbers in GA-600, "Fire Resistance Design Manual," or by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
- D. AISI Specifications: Comply with AISI's "Specification for the Design of Cold-Formed Steel Structural Members" for calculating structural characteristics of cold-formed metal framing.

## **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Studco Building Systems, Inc.
  - 2. CEMCO (California Expanded Metal Products Co.)
  - 3. ClarkDietrich Industries, Inc.
  - 4. SCAFCO Corp.

### **2.2 MATERIALS**

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.



- B. Steel Sheet: ASTM A 570/A 570M, hot rolled or ASTM A 611, cold rolled; cleaned, pretreated, and primed with manufacturer's baked-on, lead- and chromate-free, rust-inhibitive primer complying with performance requirements in FS TT-P-664, of grade as follows:
  - 1. Grade: 33 (230) or C, Type 1 or 2.

## 2.3 NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, complying with ASTM C 955, and as follows unless otherwise indicated on the structural drawings:
  - 1. Minimum Uncoated-Steel Thickness: 16 gauge (1.72 mm).
  - 2. Flange Width: 1-5/8 inches.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, complying with ASTM C 955, and as follows unless otherwise indicated on the structural drawings:
  - 1. Minimum Uncoated-Steel Thickness: Match steel studs.
  - 2. Flange Width: 1-1/4 inches.
- C. Vertical Deflection Clips: Manufacturer's standard clips, capable of accommodating upward and downward vertical displacement of primary structure.

## 2.4 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories of the same material and finish used for framing members, with a minimum yield strength of 33,000 psi (230 MPa).
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
  - 1. Supplementary framing.
  - 2. Bracing, bridging, and solid blocking.
  - 3. Web stiffeners.
  - 4. End clips.
  - 5. Foundation clips.
  - 6. Gusset plates.
  - 7. Stud kickers, knee braces, and girts.
  - 8. Hole reinforcing plates.
  - 9. Backer plates.

## 2.5 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel headless, hooked, bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- E. Mechanical Fasteners: Corrosion-resistant-coated, self-drilling, self-threading steel drill screws.
  - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

## 2.6 MISCELLANEOUS MATERIALS

- A. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, non-corrosive, non-staining grout containing selected silica sands, Portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.
- B. Sill Sealer for Exterior Steel Stud Walls:
  - 1. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
    - a. Manufacturer: Protecto Wrap Company.
    - b. Product: Premium Energy Sill Sealer® with manufacturer's recommended primer.
  - 2. Properties: 3/8 inch closed cell polyethylene foam with self-adhesive waterproofing membrane.

## 2.7 FABRICATION

- A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.
  - 1. Fabricate framing assemblies using jigs or templates.
  - 2. Cut framing members by sawing or shearing; do not torch cut.
  - 3. Fasten cold-formed metal framing members by welding. Wire tying of framing members is not permitted. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
  - 4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
  - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
  - 2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Grout bearing surfaces uniform and level to ensure full contact of bearing flanges or track webs on supporting concrete or masonry construction.

### **3.3 INSTALLATION, GENERAL**

- A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed metal framing according to ASTM C 1007, unless more stringent requirements are indicated.
- C. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.
  - 1. Cut framing members by sawing or shearing; do not torch cut.
  - 2. Fasten cold-formed metal framing members by welding. Wire tying of framing members is not permitted.
    - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.
- E. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- F. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.
- G. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work. Coordinate with Section 0 72100 - Building Insulation.
- H. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.
- I. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
  - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

### **3.4 NON-LOAD-BEARING WALL INSTALLATION**

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Install sill sealer per manufacturer's written instructions, including primer.
- C. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:
  - 1. Stud Spacing: Not more than 16 inches.
- D. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
- E. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
  - 1. Connect vertical deflection clips to bypassing/infill studs and anchor to primary building structure.
- F. Install horizontal bridging in curtain-wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
  - 1. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
- G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable curtain-wall-framing system.

### **3.5 REPAIRS AND PROTECTION**

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: Wire brush, clean, and paint scarred areas, welds, and rust spots on fabricated and installed prime-painted, cold-formed metal framing. Paint framing surfaces with same type of shop paint used on adjacent surfaces.
- C. Protect cutouts, corners, and joints in sheathing by filling with a flexible sealant or by applying tape recommended by sheathing manufacturer at time sheathing is applied.
- D. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, which ensure cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

**END OF SECTION**

## SECTION 05 5000

### METAL FABRICATIONS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Steel ladders.
  - 2. Metal stairs
    - a. Perforated steel risers
  - 3. Pipe and tube railings
  - 4. Loose bearing and leveling plates.
  - 5. Loose steel lintels.
  - 6. Shelf angles.
  - 7. Metal bar gratings with support frame
  - 8. Steel framing and supports for countertops.
  - 9. Steel framing and supports for mechanical and electrical equipment.
  - 10. Steel framing and supports for applications where framing and supports are not specified in other Sections.
  - 11. Miscellaneous metal trim.
  - 12. Pipe bollards, fixed and collapsible.
  - 13. Closure chains and locks.
- B. Related Sections include the following:
  - 1. Section 05 1200 "Structural Steel" for structural-steel framing system components.
  - 2. Section 06 1053 "Miscellaneous Rough Carpentry" for metal framing anchors and other rough hardware.

##### 1.3 SUBMITTALS

- A. Product Data: For the following:
  - 1. Paint products.
  - 2. Grout.
- B. Shop Drawings General: Detail fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
  - 1. Provide templates for anchors and bolts specified for installation under other Sections.
- C. Shop Drawings for Stairs: Show fabrication and installation details for metal stairs. Include plans, elevations, sections, and details of metal stairs and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.
- D. Welding Certificates: Copies of certificates for welding procedures and personnel.

- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- F. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### **1.4 QUALITY ASSURANCE**

- A. Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Welding: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1, "Structural Welding Code--Steel."
  - 2. AWS D1.2, "Structural Welding Code--Aluminum."
  - 3. AWS D1.3, "Structural Welding Code--Sheet Steel."
  - 4. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

#### **1.5 PERFORMANCE REQUIREMENTS FOR METAL STAIRS**

- A. Structural Performance: Provide metal stairs capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each component of metal stairs.
  - 1. Treads and Platforms of Metal Stairs: Capable of withstanding a uniform load of 100 lbf/sq. ft. or a concentrated load of 300 lbf on an area of 4 sq. in., whichever produces the greater stress.
  - 2. Stair Framing: Capable of withstanding stresses resulting from loads specified above in addition to stresses resulting from railing system loads.
  - 3. Deflection: Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch, whichever is less.

#### **1.6 PERFORMANCE REQUIREMENTS FOR HANDRAILS**

- A. General: In engineering handrails and railings to withstand structural loads indicated, determine allowable design working stresses of handrail and railing materials based on the following:
  - 1. Structural Steel: AISC S335, "Specification for Structural Steel Buildings Allowable Stress Design and Plastic Design with Commentary."
  - 2. Cold-Formed Structural Steel: AISI SG-673, Part I, "Specification for the Design of Cold-Formed Steel Structural Members."

- B. Structural Performance of Handrails and Railings: Provide handrails and railings capable of withstanding the following structural loads without exceeding allowable design working stresses of materials for handrails, railings, anchors, and connections:
1. Top Rail of Guards: Capable of withstanding the following loads applied as indicated:
    - a. Concentrated load of 200 lbf applied at any point and in any direction.
    - b. Uniform load of 50 lbf/ft. applied horizontally and concurrently with uniform load of 100 lbf/ft. applied vertically downward.
    - c. Concentrated and uniform loads above need not be assumed to act concurrently.
  2. Handrails Not Serving As Top Rails: Capable of withstanding the following loads applied as indicated:
    - a. Concentrated load of 200 lbf applied at any point and in any direction.
    - b. Uniform load of 50 lbf/ft. applied in any direction.
    - c. Concentrated and uniform loads above need not be assumed to act concurrently.
  3. Infill Area of Guards: Capable of withstanding a horizontal concentrated load of 200 lbf applied to 1 sq. ft. at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area.
    - a. Load above need not be assumed to act concurrently with loads on top rails in determining stress on guard.
- C. Thermal Movements: Provide handrails and railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.
- D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

## 1.7 PROJECT CONDITIONS

- A. Field Measurements General: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.
- B. Field Measurements for Handrails: Verify handrail and railing dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating handrails and railings without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

## 1.8 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

## 1.9 CASH ALLOWANCE

- A. Include an allowance of \$6,400.00 for miscellaneous steel, beyond that which is required by the Contract Documents at the request of the Architect/Structural Engineer on behalf of the Owner. A line item shall be provided for each material and quantified after each request. No material or labor shall be credited against this amount without written approval. Unused dollar amounts including labor shall be returned to the Owner at the completion of the Project.

## PART 2 - PRODUCTS

### 2.1 METALS, GENERAL

- A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness. Do not use steel sheet with variations in flatness exceeding those permitted by referenced standards for stretcher-leveled sheet.

### 2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.
- C. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
- E. Uncoated Hot-Rolled Steel Sheet: Commercial quality, complying with ASTM A 569/A569M or structural quality, complying with ASTM A 570, Grade 30, unless another grade is required by design loads.
- F. Steel and Iron for Handrails: Provide steel and iron in the form indicated, complying with the following requirements:
  - 1. Steel Pipe: ASTM A 53; finish, type, and weight class as follows:
    - a. Black finish, unless otherwise indicated.
    - b. Galvanized finish for exterior installations and where indicated.
    - c. Type F, or Type S, Grade A, standard weight (Schedule 40), unless another grade and weight are required by structural loads.
  - 2. Steel Tubing: Cold-formed steel tubing, ASTM A 500, Grade A, unless another grade is required by structural loads.
  - 3. Iron Castings: Malleable iron complying with ASTM A 47, Grade 32510.



- G. **Brackets, Flanges, and Anchors:** Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.
- H. **Slotted Channel Framing:** Cold-formed metal channels with flange edges returned toward web and with 9/16-inch- wide slotted holes in webs at 2 inches o.c.
  - 1. Width of Channels: 1-5/8 inches.
  - 2. Depth of Channels: 1-5/8 inches.
  - 3. Metal and Thickness: Uncoated steel complying with ASTM A 570, Grade 33; 14 gauge minimum thickness.
  - 4. Finish: Rust-inhibitive, baked-on, acrylic enamel.
- I. **Turnbuckles/Clevises:** C-1035, SA-182-F-11, Stainless steel, stub ends - hot rolled steel, galvanized finish. Provide clevis pins meeting load requirements of the rod.
- J. **Malleable-Iron Castings:** ASTM A 47, Grade 32510.
- K. **Gray-Iron Castings:** ASTM A 48, Class 30, unless another class is indicated or required by structural loads.
- L. **Cast-in-Place Anchors in Concrete:** Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
  - 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 malleable iron or ASTM A 27 cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153.
- M. **Welding Rods and Bare Electrodes:** Select according to AWS specifications for metal alloy welded.

## 2.3 ALUMINUM

- A. **Aluminum Extrusions:** ASTM B 221, alloy 6063-T6.
- B. **Glazing Channels:**
  - 1. Basis of Design: C. R. Laurence "U-Channel" extrusion; finish as selected by Architect.
  - 2. Sizes: As indicated on Drawings.

## 2.4 PAINT

- A. **Shop Primer for Ferrous Metal:** Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
  - 1. Refer to Section 09 9123 - Painting for specific primer required on identified steel items.
- C. **Galvanizing Repair Paint:** High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- D. **Bituminous Paint:** Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

## **2.5 FASTENERS**

- A. General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F 1554, Grade 36.
- D. Machine Screws: ASME B18.6.3.
- E. Lag Bolts: ASME B18.2.1.
- F. Wood Screws: Flat head, carbon steel, ASME B18.6.1.
- G. Plain Washers: Round, carbon steel, ASME B18.22.1
- H. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1.
- I. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
  - 1. Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
- J. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as needed.

## **2.6 GROUT**

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

## **2.7 CONCRETE FILL**

- A. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 4000 psi, unless otherwise indicated.
- B. Welded Wire Fabric: ASTM A 185, 6 by 6 inches -W1.4 by W1.4, unless otherwise indicated.

## **2.8 FABRICATION, GENERAL**

- A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

- B. Shear and punch metals cleanly and accurately. Remove burrs.
- C. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Weld corners and seams continuously to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- F. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- G. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.
- H. Allow for thermal movement resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.
- I. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- J. Remove sharp or rough areas on exposed traffic surfaces.
- K. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

## **2.9 FABRICATION - STEEL STAIRS**

- A. Provide complete stair assemblies, including metal framing, hangers, struts, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
  - 1. Join components by welding, unless otherwise indicated.
  - 2. Use connections that maintain structural value of joined pieces.
  - 3. Fabricate treads and platforms of exterior stairs so finished walking surfaces slope to drain.

- B. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.
- C. Commercial class, unless otherwise indicated.
- D. Shop Assembly: Preassemble stairs in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- E. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Shear and punch metals cleanly and accurately. Remove sharp or rough areas on exposed surfaces.
- F. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- G. Weld connections to comply with the following:
  1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.
  4. Weld exposed corners and seams continuously, unless otherwise indicated.
  5. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- I. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.
- J. Perforated Steel Risers: Provide, where indicated, perforated metal risers equal to 'McNichols' 9 gauge type 304 stainless steel.
  1. Perforation Size: 1/4 inch diameter holes.
  2. Staggered Centers at 60 degrees: 5/16 inch
  3. Open Area: 58 percent.
  4. Top and bottom ends to be finished with a 1-1/2 inch margin.
  5. Sides shall have a 1/2 inch margin.
  6. Finish: Mill.
- K. Solid Stainless Steel Risers: Provide, where indicated, solid 9 gauge type 304 plate stainless steel risers.
  1. Finish: Mill, to match perforated risers.

## 2.10 STEEL-FRAMED STAIRS

- A. Stair Framing: Fabricate stringers of structural-steel tubes, plates, or a combination of both, as indicated. Provide closures for exposed ends of stringers. Construct platforms of structural-steel channel headers and miscellaneous framing members as indicated. Bolt or weld headers to stringers; bolt or weld framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
1. Where stairs are enclosed by gypsum board shaft-wall assemblies, provide hanger rods to support landings from floor construction above. Locate hanger rods within stud space of shaft-wall construction.
  2. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

## 2.11 FABRICATION - HANDRAILS

- A. General: Fabricate handrails and railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble handrails and railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Form changes in direction of railing members as follows:
1. By bending.
  2. By radius bends of radius indicated.
  3. By any method indicated above, applicable to change in direction involved.
- D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- E. Welded Connections: Fabricate handrails and railings for connecting members by welding. Cope components at perpendicular and skew connections to provide close fit, or use fittings designed for this purpose. Weld connections continuously to comply with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove flux immediately.
  4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- F. Non-welded Connections: Fabricate handrails and railings by connecting members with concealed mechanical fasteners and fittings, unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
1. Fabricate splice joints for field connection using an epoxy structural adhesive where this is manufacturer's standard splicing method.
- G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing members to other work, unless otherwise indicated.

- H. Provide inserts and other anchorage devices for connecting handrails and railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.
- I. For railing posts set in concrete, provide preset sleeves of steel not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, and steel plate forming bottom closure.
- J. For removable railing posts, fabricate slip-fit sockets from steel tube whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.
  - 1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.
- K. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.
- L. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.
- M. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.
- N. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members that are exposed to exterior or to moisture from condensation or other sources.
- O. Fabricate joints that will be exposed to weather in a watertight manner.
- P. Close exposed ends of handrail and railing members with prefabricated end fittings.
- Q. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of railing and wall is 1/4 inch or less.
- R. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

## **2.12 STEEL LADDERS**

- A. General: Fabricate ladders for locations shown, with dimensions, spacings, details, and anchorages as indicated.
  - 1. Comply with ANSI A14.3, unless otherwise indicated.
  - 2. For elevator pit ladders, comply with ASME A17.1.
- B. Siderails: Continuous, 1/2-by-2-1/2-inch steel flat bars, with eased edges, spaced 18 inches apart.
- C. Bar Rungs: 3/4-inch- diameter steel bars, spaced 12 inches o.c.

- D. Fit rungs in centerline of side rails; plug-weld and grind smooth on outer rail faces.
- E. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets. Size brackets to support design loads specified in ANSI A14.3.
- F. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
- G. Provide galvanized ladders, including brackets and fasteners, at all exterior locations.
- H. At ladders at roof hatches, provide ladder safety post.
  - 1. Basis of Design: Contract Documents are based on product specified below to establish a standard of quality. Other available manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor, and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
    - a. Manufacturer: The Bilco Company
    - b. Product: Type LU Ladder Safety Post.
  - 2. Performance Characteristics:
    - a. Tubular post shall lock automatically when fully extended.
    - b. Safety post shall have controlled upward and downward movement.
    - c. Release lever shall disengage the post to allow it to be returned to its lowered position.
    - d. Post shall have adjustable mounting brackets to fit ladder rung spacing up to 14 inches on center and clamp brackets to accommodate ladder rungs up to 1-3/4 inches in diameter.
  - 3. Post: Shall be manufactured of high strength square tubing. A pull up loop shall be provided at the upper end of the post to facilitate raising the post.
  - 4. Material of construction: Steel.
  - 5. Balancing Spring: A stainless steel spring balancing mechanism shall be provided to provide smooth, easy, controlled operation when raising and lowering the safety post.
  - 6. Hardware: Mounting hardware shall be Type 316 stainless steel.
  - 7. Factory Finish: Yellow powder coat steel

## **2.13 LOOSE BEARING AND LEVELING PLATES**

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize plates after fabrication.

## **2.14 LOOSE STEEL LINTELS**

- A. Fabricate loose structural-steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
- B. Weld adjoining members together to form a single unit where as required.
- C. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches, unless otherwise indicated.
- D. Galvanize loose steel lintels located in exterior walls.

## **2.15 SHELF ANGLES**

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete. Align expansion joints in angles with indicated control and expansion joints in cavity-wall exterior wythe.
- C. Galvanize shelf angles to be installed in exterior walls
- D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

## **2.16 MISCELLANEOUS FRAMING AND SUPPORTS**

- A. General: Provide steel framing and supports that are not a part of structural-steel framework as necessary to complete the Work.
- B. Fabricate units from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
  - 1. Fabricate units from slotted channel framing where required for deflection.
  - 2. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors 1-1/4 inches wide by 1/4 inch thick by 8 inches long at 24 inches o.c., unless otherwise indicated.
  - 3. Furnish inserts if units must be installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports in the following locations:
  - 1. Exterior locations and where miscellaneous items will be concealed from view.

## **2.17 MISCELLANEOUS STEEL TRIM**

- A. Unless otherwise indicated, fabricate units from structural-steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than 6 inches from each end, 6 inches from corners, and 24 inches o.c., unless otherwise indicated.
- C. Galvanize miscellaneous steel trim in the following locations:
  - 1. Exterior.



## 2.18 PIPE BOLLARDS

- A. Fabricate pipe bollards from Schedule 40 steel pipe.
- B. Fabricate sleeves for bollard anchorage from steel pipe with 1/4-inch thick steel plate welded to bottom of sleeve.
- C. Fabricate internal sleeves for removable bollards from Schedule 40 steel pipe or 1/4-inch wall-thickness steel tubing with an OD 1/16 inch less than ID of bollards. Match drill sleeve and bollard for 1/2-inch steel machine bolt.
- D. Equip bollards used at drive closures with eye bolts to accommodate chains; color to match bollard.

## 2.19 COLLAPSIBLE BOLLARDS

- A. Basis of Design: Contract Documents are based on product specified below to establish a standard of quality. Other manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
  - 1. Manufacturer: Reliance Foundry Co. Ltd.
  - 2. Product: Model R-8430.
- B. Properties:
  - 1. Size: 24.5 inches H x 2.5 inches diameter; 5 inch base. 12 lbs.
  - 2. Design: Cylindrical with built-in mounting hardware and internal locking mechanism. Coordinate keying with Owner's master system
  - 3. Material: ASTM A36 steel; safety yellow powder coat finish.
  - 4. Installation: Collapsible, hinged surface mount.

## 2.20 CHAINS

- A. Powder coated, zinc-plate undercoated, 3/8 inch chain (links: 3/8 inch T x 3 inches L x 1-3/8 inch W); 2000 lb. working load limit; length as required to close drive opening; color as selected by Architect from manufacturer's standard colors.
- B. Padlocks:
  - 1. Owner-furnished keyed padlock connecting one end of chain to bollard.
  - 2. Contractor-provided Knox model 3770 exterior heavy duty padlock with stainless steel shackle, for connecting opposite end of chain to other bollard. Coordinate keying requirements with local fire department.

## 2.21 GATES

- A. Construction: 1 inch steel tube section pickets, welded to 3 x 1-1/2 x 1/4 inch tube sections; supported by 4 x 4 x 3/16 inch steel posts. Cap open ends with steel plates, weld and grind smooth. No gaps in seams..
- B. Dimensions as shown on Drawings.

- C. Gate Hardware: Provide galvanized hardware and accessories for each gate according to the following:
1. Hinges: Greasable barrel-type, welded to gate frame and gate post. Min. carrying capacity: 1000 lb. Size and material to suit gate size, non-lift-off type, offset to permit 180-degree gate opening. Provide 1-1/2 pair of hinges for each leaf over 6-foot nominal height. Hinges shall be self-closing type, designed to keep gate in closed position.
  2. Gate Stops: Provide gate stops for double gates; as shown on Drawings.
  3. Hardware: Provide latchsets, provided under Section 08710 - Door Hardware.
  4. Keeper: Provide a keeper for vehicle gates that automatically engages gate leaf and holds it in the open position until manually released. Keeper to be 'Gate Keeper' # 6715 as supplied by Mountain States Fence, or equivalent as judged by Architect. Locate to allow gate to open 180 degrees.
  5. See Division 8 Section "Door Hardware" for additional hardware descriptions and criteria.
- D. Finish: Field paint; see Division 9 Section "Painting" for paint system. Paint all exposed surfaces of gate, frame, and hardware

## **2.22 FINISHES, GENERAL**

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

## **2.23 STEEL AND IRON FINISHES**

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
1. ASTM A 123, for galvanizing steel and iron products.
  2. ASTM A 153, for galvanizing steel and iron hardware.
- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:
1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- C. Application: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

## **2.24 ALUMINUM FINISHES**

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.

## **2.25 POWDER COAT FINISH**

- A. Powder Coat Finish: Prepare, treat, and coat non-galvanized ferrous metal to comply with resin manufacturer's written instructions and as follows:
  - 1. Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6, "Commercial Blast Cleaning."
  - 2. Treat prepared metal with iron-phosphate pretreatment, rinse, and seal surfaces.
  - 3. Apply thermosetting polyester or acrylic urethane powder coating with cured-film thickness not less than 1.5 mils.
  - 4. Color: As Selected by Architect from manufacturer's full range.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION, GENERAL**

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- E. Field Welding: Comply with the following requirements:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

### **3.2 INSTALLATION - STEEL STAIRS**

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free from rack.

- C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete, unless otherwise indicated.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- F. Field Welding: Comply with the following requirements:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

### **3.3 INSTALLING METAL STAIRS WITH GROUTED BASEPLATES**

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of baseplates.
- B. Set steel stair baseplates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
  - 1. Use nonmetallic, non-shrink grout, unless otherwise indicated.
  - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

### **3.4 SETTING BEARING AND LEVELING PLATES**

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
  - 1. Use non-shrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use non-shrink, nonmetallic grout in exposed locations, unless otherwise indicated.
  - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

### **3.5 INSTALLATION - HANDRAILS**

- A. Fit exposed connections together to form tight, hairline joints.

- B. Perform cutting, drilling, and fitting required to install handrails and railings. Set handrails and railings accurately in location, alignment, and elevation; measured from established lines and levels and free from rack.
  - 1. Do not weld, cut, or abrade surfaces of handrail and railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
  - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
  - 3. Align rails so variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Corrosion Protection: Coat concealed surfaces that will be in contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.
- D. Adjust handrails and railings before anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated, but not less than that required by structural loads.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings and for properly transferring loads to in-place construction.

### 3.6 RAILING CONNECTIONS

- A. Non-welded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of handrails and railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

### 3.7 ANCHORING POSTS FOR RAILINGS

- A. Cover anchorage joint with flange of same metal as post, attached to post as follows:
  - 1. By set screws.
- B. Anchor posts to metal **surfaces** with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
  - 1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

### 3.8 ANCHORING RAILING ENDS

- A. Anchor railing ends into concrete and masonry with round flanges connected to railing ends and anchored into wall construction with post-installed anchors and bolts.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces.
  - 1. Connect flanges to railing ends using non-welded connections.

### **3.9 ATTACHING HANDRAILS TO WALLS**

- A. Attach handrails to wall with wall brackets. Provide bracket with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface.
- B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- C. Secure wall brackets to building construction as follows:
  - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
  - 2. For hollow masonry anchorage, use toggle bolts.
  - 3. For steel-framed gypsum board assemblies, use hanger or lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.

### **3.10 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS**

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.
- B. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
  - 1. Where grout space under bearing plates is indicated at girders supported on concrete or masonry, install as specified above for setting and grouting bearing and leveling plates.

### **3.11 INSTALLING PIPE BOLLARDS**

- A. Anchor bollards in place with concrete footings. Support and brace bollards in position in footing excavations until concrete has been placed and cured.
- B. Anchor internal sleeves for removable bollards in place with concrete footings. Support and brace sleeves in position in footing excavations until concrete has been placed and cured.
  - 1. Place removable bollards over internal sleeves and secure with 1/2-inch machine bolts and nuts. After tightening nuts, drill holes in bolts for inserting padlocks. Owner will furnish padlocks.
  - 2. Do not fill removable bollards with concrete.
- C. Fill bollards solidly with concrete, mounding top surface.

### **3.12 ADJUSTING AND CLEANING**

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

**END OF SECTION**

## SECTION 05 5213.13

### EXTERIOR STAINLESS STEEL PIPE AND TUBE RAILINGS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes stainless-steel exterior railings.

##### 1.3 DEFINITIONS

- A. Railings: Guardrails, handrails, and similar devices used for protection of occupants at open- sided floor areas, pedestrian guidance and support, visual separation, or wall protection.

##### 1.4 PERFORMANCE REQUIREMENTS

- A. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
  - 1. Stainless Steel: 60 percent of minimum yield strength.
- B. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  - 1. Handrails:
    - a. Uniform load of 50 lbf/ ft. applied in any direction.
    - b. Concentrated load of 200 lbf applied in any direction.
    - c. Uniform and concentrated loads need not be assumed to act concurrently.
- C. Thermal Movements: Provide exterior railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.
- D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

##### 1.5 SUBMITTALS

- A. Product Data: For the following:
  - 1. Manufacturer's product lines of railings assembled from standard components.
  - 2. Grout, anchoring cement, and paint products.

- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Samples: For each type of exposed finish required.
  - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
  - 2. Fittings and brackets.
  - 3. Welded connections.
  - 4. Assembled Samples of railing systems, made from full-size components, including top rail, post, handrail, and infill. Show method of finishing members at intersections. Samples need not be full height.
- D. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- E. Welding certificates.
- F. Qualification Data: For professional engineer.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according ASTM E 894 and ASTM E 935.

## 1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing through one source from a single manufacturer.
- B. Product Options: Attached detail indicates size and the style of railings
  - 1. Do not modify intended aesthetic effects, as judged solely by WSU Project Manager, except with Project Manager's approval. If modifications are proposed, submit comprehensive explanatory data to Project Manager for review.
- C. Welding: Qualify procedures and personnel according to the following:
  - 1. AWS D1.6, "Structural Welding Code--Stainless Steel."
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
  - 1. Build mockup for each type of railing to be provided (guardrail, handrail, etc...)
  - 2. Build mockups that show weld quality, bends, and tube thickness of each tube diameter.
  - 3. Each mockup must include at least one seamless butt joint, one tee joint, and one corner joint or bend.

## 1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.



## 1.8 COORDINATION AND SCHEDULING

- A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

## PART 2 - PRODUCTS

### 2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails, unless otherwise indicated.
  - 1. Provide cast-metal brackets with flange tapped for concealed anchorage to threaded hanger bolt.
  - 2. Provide either formed- or cast-metal brackets with predrilled hole for exposed bolt anchorage.
  - 3. Provide formed-steel brackets with predrilled hole for bolted anchorage and with snap-on cover that matches rail finish and conceals bracket base and bolt head.
  - 4. Provide extruded-aluminum brackets with interlocking pieces that conceal anchorage. Locate set screws on bottom of bracket.

### 2.2 STAINLESS STEEL

- A. Tubing: ASTM A 554, Grade MT 316L (marine grade stainless steel), 1/8 inch wall, minimum.

### 2.3 FASTENERS

- A. General: Provide the following:
  - 1. Stainless-Steel Components: Type 316L stainless-steel fasteners.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Provide concealed fasteners for attaching railings to other work, unless otherwise indicated.
  - 1. Provide tamper-resistant flat-head machine screws for exposed fasteners, unless otherwise indicated.
- D. Anchors: Provide cast-in-place chemical or torque-controlled expansion anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

## 2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

## 2.5 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces. All field connections shall be welded.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate exposed connections to be weather tight. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Provide continuous weld at all connections and fittings.
  - 1. Use materials and methods that minimize distortion and maintain strength and corrosion resistance of base metals. Ensure that stainless steel does not contact non stainless steel materials during the fabrication process to prevent surface contamination.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove flux immediately.
  - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- H. Form changes in direction by bending or by inserting prefabricated elbow fittings.
- I. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- J. Close exposed ends of hollow railing members with prefabricated end fittings.
- K. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.

Close ends of returns, unless clearance between end of rail and wall is **1/4 inch (6 mm)** or less.

- L. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.
  - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide fillers made from crush-resistant material, or other means to transfer wall loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- M. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

## **2.6 FINISHES, GENERAL**

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment. All protection shall be removed and disposed by the contractor prior to completion of project.
- C. Appearance of **Finished Work**: Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## **2.7 STAINLESS-STEEL FINISHES**

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform finish indicated, free of cross scratches.
- C. Helically Polished Satin Finish: No. 4.
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION, GENERAL**

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
  - 1. Unless intended for field welded connection, do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication.

2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
  3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

### **3.2 RAILING CONNECTIONS**

- A. Welded Connections: Use fully welded joints for permanently connecting railing components.
- B. Comply with requirements for welded connections in Part 2 "Fabrication" Article whether welding is performed in the shop or in the field.

### **3.3 ANCHORING POSTS**

- A. Form or core-drill holes not less than 6 inches deep and 3 inch diameter for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with non-shrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Anchor posts to metal surfaces with flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
  1. For stainless-steel railings, weld flanges to posts and bolt to metal-supporting surfaces.
- C. Install removable railing sections, where indicated, in slip-fit stainless steel sockets cast in concrete.

### **3.4 ANCHORING RAILING ENDS**

- A. Anchor railing ends to concrete and masonry with stainless steel sleeves concealed within railing ends and anchored to wall construction with 316 stainless steel anchors and bolts.
- B. Anchor railing ends to metal surfaces with stainless steel flanges bolted to metal surfaces and welded to railing ends.

### **3.5 ATTACHING HANDRAILS TO WALLS**

- A. Attach handrails to walls with wall brackets. Provide brackets with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface.
- B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- C. Secure stainless steel wall brackets to building construction as follows:
  1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
  2. For hollow masonry anchorage, use toggle bolts.

### **3.6 FIELD QUALITY CONTROL**

- A. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports. Payment for these services will be made by Owner.
- B. Extent and Testing Methodology: Testing agency will randomly select completed railing assemblies for testing that are representative of different railing designs and conditions in the completed Work. Railings will be tested according to ASTM E 894 and ASTM E 935 for compliance with performance requirements.
- C. Remove and replace railings where test results indicate that they do not comply with specified requirements unless they can be repaired in a manner satisfactory to Architect and will comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### **3.7 CLEANING**

- A. Clean stainless steel by washing thoroughly with clean water and soap, rinsing with clean water, and wiping dry.

### **3.8 PROTECTION**

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in field to shop; make required alterations and refinish entire unit, or provide new units.

**END OF SECTION**

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## SECTION 05 7300

### ORNAMENTAL HANDRAILS AND RAILINGS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes ornamental steel handrails & railings including:
  - 1. Stainless steel handrails.
  - 2. Stainless steel mounting hardware.
  - 3. Laminated tempered glass structural infill panels.
- B. Related Sections include the following:
  - 1. Section 05 5000 "Metal Fabrications" for handrails and railings associated with metal stairs and for handrails and railings fabricated from pipe and tube components.
  - 2. Section 08 8000 "Glazing" for glass used in applications other than handrails.

##### 1.3 PERFORMANCE REQUIREMENTS

- A. General: In engineering handrails and railings to withstand structural loads indicated, determine allowable design working stresses of materials based on the following:
  - 1. Cold-Formed Structural Steel: AISI SG-673, Part I, "Specification for the Design of Cold-Formed Steel Structural Members."
- B. Structural Performance of Handrails and Railings: Provide handrails and railings capable of withstanding the following structural loads without exceeding allowable design working stress of materials for handrails, railings, anchors, and connections:
  - 1. Top Rail of Guards: Capable of withstanding the following loads applied as indicated:
    - a. Concentrated load of 200 lbf applied at any point and in any direction.
    - b. Uniform load of 50 lbf/ft. applied horizontally and concurrently with uniform load of 100 lbf/ft. applied vertically downward.
    - c. Concentrated and uniform loads above need not be assumed to act concurrently.
  - 2. Handrails Not Serving As Top Rails: Capable of withstanding the following loads applied as indicated:
    - a. Concentrated load of 200 lbf applied at any point and in any direction.
    - b. Uniform load of 50 lbf/ft applied in any direction.
    - c. Concentrated and uniform loads above need not be assumed to act concurrently.
  - 3. Infill Area of Guards: Capable of withstanding a horizontal concentrated load of 200 lbf applied to 1 sq. ft. at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area.
    - a. Load above need not be assumed to act concurrently with loads on top rails in determining stress on guard.

- C. Thermal Movements: Provide handrails and railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.
- D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

#### **1.4 SUBMITTALS**

- A. Product Data: For manufacturer's product lines of handrails and railings assembled from standard components.
  - 1. Include Product Data for grout, anchoring cement, and paint products.
- B. Shop Drawings: Show fabrication and installation of handrails and railings. Include plans, elevations, sections, details, and attachments to other Work.
  - 1. For installed handrails and railings indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Samples for Selection: Manufacturer's color charts showing the full range of colors available for products with factory-applied color finishes.
- D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Product Test Reports: Indicating products comply with requirements, based on comprehensive testing of current products.

#### **1.5 QUALITY ASSURANCE**

- A. Source Limitations: Obtain each type of railing through one source from a single manufacturer.
- B. Mockups: Before installing handrails and railings, build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
  - 1. Build mockups in the location indicated or, if not indicated, as directed by Architect.
  - 2. Build mockups for each form and finish of railing consisting of two posts, top rail, infill area, and anchorage system components that are full height and are not less than 24 inches in length.
  - 3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
  - 4. Obtain Architect's approval of mockups before fabricating ornamental handrails and railings.



5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed.
7. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## **1.6 STORAGE**

- A. Store handrails and railings in a dry, well-ventilated, weathertight place.

## **1.7 PROJECT CONDITIONS**

- A. Field Measurements: Verify handrail and railing dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating handrails and railings without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

## **1.8 COORDINATION**

- A. Coordinate installation of anchorages for handrails and railings. Furnish Setting Drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

## **1.9 SCHEDULING**

- A. Schedule installation so handrails and railings are mounted only on completed walls. Do not support temporarily by any means that do not satisfy structural performance requirements.

## **PART 2 - PRODUCTS**

### **2.1 METALS**

- A. General: Provide metal free from pitting, seam marks, roller marks, stains, discolorations, and other imperfections where exposed to view on finished units.
- B. Steel and Iron: Provide steel and iron in the form indicated, complying with the following requirements:
  1. Steel Tubing: Cold-formed steel tubing, ASTM A 500, Grade A, unless another grade is indicated or required by structural loads.
  3. Steel Rails and Bars: Hot-rolled, carbon steel complying with ASTM A 29, Grade 1010.
  4. Steel Plates, Shapes, and Bars: ASTM A 36.
  5. Iron Castings: Malleable iron complying with ASTM A 47, Grade 32510.
- C. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

## 2.2 GLASS PRODUCTS, GLAZING AND INFILL MATERIALS.

- A. Laminated Glass: ASTM C 1172, Condition A (uncoated), Type LT (laminated fully tempered clear glass), Quality-Q3 with two plies of glass and polyvinyl butyral interlayer not less than 0.060 inch thick.
  - 1. Tempered Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated), Type 1 (transparent glass, flat), Quality q3 (glazing select). Provide products complying with requirements indicated below for class, thickness, and manufacturing process that have been tested for surface and edge compression according to ASTM C 1048 and for impact strength according to 16 CFR, Part 1201 for Category II materials.
    - a. Manufacturing Process: Manufacture fully tempered glass by horizontal (roller-hearth) process with roll-wave distortion parallel with bottom edge of glass as installed, unless otherwise indicated
  - 2. Thickness: As required for structural loads, but not less than 1/2 inch.
  - 3. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
    - a. Locate marking in inconspicuous area, below floor line and in corner of glass panel.
- B. Fabrication
  - 1. Clean-cut or flat-grind edges at butt-glazed sealant joints to produce square edges with slight chamfers at junctions of edges and faces.
  - 2. Grind smooth exposed edges, including those at open joints, to produce square edges with slight chamfers at junctions of edges and faces.
  - 3. Align glass plies at edges within 1/32 inch.

## 2.3 WELDING MATERIALS, FASTENERS AND ANCHORS

- A. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded or brazed and as required for color match, strength, corrosion resistance, and compatibility in fabricated items.
- B. Fasteners for Anchoring Handrails and Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring handrails and railings to other types of construction indicated and capable of withstanding design loads.
  - 1. For steel handrails, railings, and fittings, use plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
- C. Fasteners for Interconnecting Handrail and Railing Components: Use fasteners fabricated from same basic metal as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.
  - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other Work, unless otherwise indicated.
- D. Cast-in-Place and Postinstalled Anchors: Anchors of type indicated below, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
  - 1. Cast-in-place anchors.
  - 2. Expansion anchors.

## 2.4 PAINT

- A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- B. Shop Primer for Galvanized Steel: Zinc-dust, zinc-oxide primer formulated for priming zinc-coated steel and for compatibility with finish paint systems indicated, and complying with SSPC-Paint 5.
- C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 but containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

## 2.5 GROUT AND ANCHORING CEMENT

- A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

## 2.6 FABRICATION

- A. Assemble handrails and railings in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- B. Form changes in direction of railing members as follows:
  - 1. By bending.
  - 2. By flush radius bends.
  - 3. By any method indicated above, applicable to change in direction involved.
- C. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain profile of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- D. Welded Connections: Fabricate handrails and railings for connecting members by welding. Cope components at perpendicular and skew connections to provide close fit, or use fittings designed for this purpose. Weld connections continuously to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove flux immediately.
  - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- E. Brackets, Flanges, Fittings, and Anchors: Provide manufacturer's standard wall brackets, flanges, miscellaneous fittings, and anchors to connect handrail and railing members to other construction.

- F. Provide inserts and other anchorage devices to connect handrails and railings to concrete or masonry. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.
- G. For railing posts set in concrete, provide preset sleeves of steel not less than 6 inches long with inside dimensions not less than 1/2 inch larger than outside dimensions of post, and steel plate forming bottom closure.
- H. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.
- I. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.
- J. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.
- K. Provide weep holes or another means to drain entrapped water in hollow sections of railing members that are exposed to exterior or to moisture from condensation or other sources.
- L. Fabricate joints that will be exposed to weather in a watertight manner.
- M. Close exposed ends of railing members with prefabricated end fittings.
- N. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of railing and wall is 1/4 inch or less.
- O. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

## **2.7 FINISHES, GENERAL**

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## **2.8 STEEL AND IRON FINISHES**

- A. Galvanized Handrails and Railings: Hot-dip galvanize exterior steel and iron handrails and railings to comply with ASTM A 123. Hot-dip galvanize hardware for exterior steel and iron handrails and railings to comply with ASTM A 153/A 153M.

- B. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- C. For galvanized handrails and railings, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- D. For ungalvanized steel handrails and railings, provide ungalvanized ferrous metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.
- E. Preparation for Shop Priming: After galvanizing, thoroughly clean handrails and railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic-phosphate process.
- F. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed handrails and railings:
  - 1. Exteriors (SSPC Zone 1B): SSPC-SP 6, "Commercial Blast Cleaning."
  - 2. Interiors (SSPC Zone 1A): SSPC-SP 7, "Brush-off Blast Cleaning."
- G. Apply shop primer to prepared surfaces of handrails and railings, unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
  - 1. Do not apply primer to galvanized surfaces.
  - 2. Stripe paint edges, corners, crevices, bolts, and welds.
  - 3. Delete shop primer where railings are indicated to receive a clear coat finish.

## **2.9 STAINLESS STEEL FINISHES**

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform finish indicated, free of cross scratches.
  - 1. Run grain of directionally textured finishes with long dimension of each piece.
- C. Directional Satin Finish: No. 4.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

### **3.2 INSTALLATION, GENERAL**

- A. Fit exposed connections together to form tight, hairline joints.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing handrails and railings. Set handrails and railings accurately in location, alignment, and elevation, measured from established lines and levels and free from rack.
  - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.

2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
  3. Align rails so variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Corrosion Protection: Coat concealed surfaces of stainless steel that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- D. Adjust handrails and railings before anchoring to ensure alignment at abutting joints. Space posts at interval indicated, but not less than that required by structural loads.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings and for properly transferring loads to in-place construction.

### **3.3 RAILING CONNECTIONS**

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in shop or in field.
- B. Expansion Joints: Install expansion joints at locations indicated but not further apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 6 inches of post.

### **3.4 ANCHORING POSTS**

- A. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's written instructions:
- B. Cover anchorage joint with a flange of same metal as post, attached to post as follows:
1. By set screws.
- C. Anchor posts to metal surfaces with flanges, angle or floor type as required by conditions, connected to posts and to metal supporting members as follows:
1. For steel railings, weld flanges to post and bolt to metal supporting members.
- D. Anchor rail ends to concrete and masonry with flanges connected to rail ends and anchored with postinstalled anchors and bolts.
- E. Anchor rail ends to metal surfaces with flanges bolted to metal surfaces.
1. Connect flanges to rail ends using nonwelded connections.

### **3.5 ATTACHING HANDRAILS TO WALLS**

- A. Attach handrails to wall with wall brackets. Provide bracket with 1-1/2-inch clearance from inside face of handrail and finished wall surface.
- B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

- C. Secure wall brackets to building construction as follows:
  - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
  - 2. For hollow masonry anchorage, use toggle bolts.
  - 3. For steel-framed gypsum board assemblies, use hanger or lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.

### **3.6 CLEANING**

- A. Clean and polish glass.
- B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

### **3.7 PROTECTION**

- A. Protect finishes of handrails and railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in field to shop; make required alterations and refinish entire unit, or provide new units.

**END OF SECTION**

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**DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES**

Section 06 1053

Miscellaneous Rough Carpentry

Section 06 1643

Gypsum Sheathing

Section 06 2000

Finish Carpentry

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## SECTION 06 1053

### MISCELLANEOUS ROUGH CARPENTRY

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Rooftop equipment bases and support curbs.
  - 2. Wood furring, grounds, nailers, and blocking.
  - 3. Provide solid wood blocking at the following locations including, but not limited to:
    - a. Door stops.
    - b. Grab bars.
    - c. Parapet Caps
    - d. Wall mounted toilet accessories.
    - e. Provide 2 rows each at base and upper cabinets and casework.
    - f. AV Monitor Brackets
    - g. Toilet partitions.
    - h. Mirrors.
    - i. Markerboards.
    - j. Other wall mounted fixtures.
- B. Related Sections:
  - 1. Section 09 2216 "Non-Structural Metal Framing" for metal strap blocking.

##### 1.3 SUBMITTALS

- A. Wood treatment data as follows, including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated materials:
  - 1. For each type of preservative-treated wood product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
  - 2. For waterborne-treated products, include statement that moisture content of treated materials was reduced to levels indicated before shipment to Project site.
- B. Submit research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction evidencing compliance of the following wood products with specified requirements and building code in effect for Project.
  - 1. Engineered wood products.
- D. Material test reports from a qualified independent testing agency indicating and interpreting test results relative to compliance of fire-retardant-treated wood products with performance requirements indicated.
- E. Warranty of chemical treatment manufacturer for each type of treatment.

## 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.
  - 1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

## PART 2 - PRODUCTS

### 2.1 LUMBER, GENERAL

- A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.
- B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:
  - 1. NELMA - Northeastern Lumber Manufacturers Association.
  - 2. RIS - Redwood Inspection Service.
  - 3. SPIB - Southern Pine Inspection Bureau.
  - 4. WCLIB - West Coast Lumber Inspection Bureau.
  - 5. WWPA - Western Wood Products Association.
- C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
  - 1. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece.
- D. Nominal Sizes: Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
  - 1. Provide dressed lumber, S4S, unless otherwise indicated.
  - 2. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

### 2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. General: Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWPA C2 (lumber) and AWPA C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.
  - 1. Do not use chemicals containing chromium or arsenic.
  - 2. For exposed items indicated to receive stained finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- B. Pressure treat aboveground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft. After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:
  - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
- C. Pressure treat wood members in contact with ground or freshwater with waterborne preservatives to a minimum retention of 0.40 lb/cu. ft.

### 2.3 FIRE-RETARDANT TREATMENT BY PRESSURE PROCESS

- A. General: Where fire-retardant-treated wood is indicated, pressure impregnate lumber and plywood with fire-retardant chemicals to comply with AWPA C20 and C27, respectively, for treatment type indicated; identify "fire-retardant-treated wood" with appropriate classification marking of Underwriters Laboratories, Inc., U.S. Testing, Timber Products Inspection, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.
1. Current Evaluation/Research Reports: Provide fire-retardant- treated wood for which a current model code evaluation/research report exists that is acceptable to authorities having jurisdiction and that evidences compliance of fire-retardant-treated wood for application indicated.
- B. Interior Type A: For interior locations use fire-retardant chemical formulation that produces treated lumber and plywood with the following properties under conditions present after installation:
1. No reduction takes place in bending strength, stiffness, and fastener holding capacities below values published by manufacturer of chemical formulation that are based on tests by a qualified independent testing laboratory of treated wood products identical to those indicated for this Project under elevated temperature and humidity conditions simulating installed conditions.
  2. No other form of degradation occurs due to acid hydrolysis or other causes related to manufacture and treatment.
  3. No corrosion of metal fasteners results from their contact with treated wood.
- C. Exterior Type: Use for exterior locations and where indicated.
- D. Inspection: Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.
- E. Products: Subject to compliance with requirements, provide one of the following:
1. Interior Type A Fire-Retardant-Treated Wood:
    - a. "Dricon" Arxada.
    - b. "Pyro-Guard" Hoover Treated Wood Products.
    - c. "FlamePro" Koppers Performance Chemicals.
  2. Exterior Type Fire-Retardant-Treated Wood:
    - a. "Exterior Fire-X" Hoover Treated Wood Products.

### 2.4 DIMENSION LUMBER

- A. General: Provide dimension lumber of grades indicated according to the ALSC National Grading Rule (NGR) provisions of the inspection agency indicated.
1. Grade: Standard, Stud, or No. 3.
  2. Species: Hem-fir; WCLIB or WWPA.

### 2.5 MISCELLANEOUS LUMBER

- A. General: Provide lumber for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.

- B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.
- C. Moisture Content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.
- D. Grade: For dimension lumber sizes, provide No. 3 or Standard grade lumber per ALSC's NGRs of any species. For board-size lumber, provide No. 3 Common grade per NELMA, NLGA, or WWPA; No. 2 grade per SPIB; or Standard grade per NLGA, WCLIB or WWPA of any species.

## **2.6 WOOD-BASED STRUCTURAL-USE PANELS**

- A. Miscellaneous Concealed Plywood: C-C Plugged Exterior, thickness as indicated but not less than 1/2 inch.
- B. Miscellaneous Exposed Plywood: A-D Interior, thickness as indicated but not less than 1/2 inch

## **2.7 PLYWOOD BACKING PANELS**

- A. For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade, C-D Plugged Exposure 1, in thickness indicated or, if not otherwise indicated, not less than 15/32 inch thick.

## **2.8 FASTENERS**

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
  - 1. Where miscellaneous carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.
- B. Nails, Wire, Brads, and Staples: FS FF-N-105.
- C. Power-Driven Fasteners: CABO NER-272.
- D. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

## **2.9 METAL FRAMING ANCHORS**

- A. General: Provide galvanized steel framing anchors of structural capacity, type, and size indicated and as follows:
  - 1. Research or Evaluation Reports: Provide products for which model code research or evaluation reports exist that are acceptable to authorities having jurisdiction and that evidence compliance of metal framing anchors for application indicated with building code in effect for Project.
  - 2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, which meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis, and demonstrated by comprehensive testing performed by a qualified independent testing agency.

- B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653, G60 coating designation; structural, commercial, or lock-forming quality, as standard with manufacturer for type of anchor indicated.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION, GENERAL**

- A. Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.
- C. Fit carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.
- D. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.
- E. Securely attach carpentry work as indicated and according to applicable codes and recognized standards.
- F. Countersink nail heads on exposed carpentry work and fill holes with wood filler.
- G. Use fasteners of appropriate type and length. Predrill members when necessary to avoid splitting wood.

### **3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS**

- A. Install where shown and where required for screeding or attaching other work. Cut and shape to required size. Coordinate locations with other work involved.
- B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

### **3.3 WOOD FURRING**

- A. Install plumb and level with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

### **3.4 INSTALLATION OF STRUCTURAL-USE PANELS**

- A. General: Comply with applicable recommendations contained in APA Form No. E30, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.
  - 1. Comply with "Code Plus" provisions of above-referenced guide.

**END OF SECTION**

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## SECTION 06 1643

### GYPSUM SHEATHING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Glass-mat gypsum sheathing board.
- B. Related Sections include the following:
  - 1. Section 05 4000 "Cold-Formed Metal Framing" for steel framing.
  - 2. Section 07 6200 "Sheet Metal Flashing and Trim" for flashing installed with gypsum sheathing.
  - 3. Section 07 9200 "Joint Sealants" for sealants applied with gypsum sheathing.
  - 4. Section 09 2900 "Gypsum Board" for steel framing and interior gypsum panels incorporated into assemblies with gypsum sheathing on the exterior.

##### 1.3 DEFINITIONS

- A. Gypsum Board Construction Terminology Standard: Refer to ASTM C 11 for definitions of terms for gypsum sheathing board construction not defined in this Section or in other referenced standards.

##### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.

##### 1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory."

##### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, or other causes. Stack sheathing flat on leveled supports off the ground, under cover, and fully protected from weather.

##### 1.7 COORDINATION

- A. Glass-Mat Gypsum Sheathing Board:
  - 1. Do not leave exposed to weather for more than 180 days.

## **PART 2 - PRODUCTS**

### **2.1 GYPSUM SHEATHING**

- A. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M.
  - 1. Available Products: Subject to compliance with requirements of Contract Documents, manufacturers include but are not limited to:
    - a. "Dens-Glass Gold" by G-P Gypsum Corporation.
    - b. "GlasRoc" by CertainTeed Inc.
    - c. "Securock Glass-Mat Sheathing" by USG.
  - 2. Type and Thickness: Type X, 5/8 inch thick.
  - 3. Size: Not less than 48 by 96 inches for vertical installation.

### **2.2 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS**

- A. Glass-Mat Gypsum Sheathing Board:
  - 1. Silicone Emulsion Sealant: ASTM C 834, compatible with sheathing tape and sheathing, recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.
  - 2. Glass-Fiber Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing board and with a history of successful in-service use.

### **2.3 ACCESSORY MATERIALS**

- A. Fasteners: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
  - 1. For steel framing less than 0.0329 inch thick, attach sheathing with steel drill screws complying with ASTM C 1002.
  - 2. For steel framing from 0.033 to 0.112 inch thick, attach sheathing with drill screws complying with ASTM C 954.

## **PART 3 - EXECUTION**

### **3.1 GYPSUM SHEATHING INSTALLATION**

- A. Comply with GA-253 and manufacturer's written instructions.
- B. Cut boards at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.
  - 1. Install boards with a 3/8-inch setback where non-load-bearing construction abuts structural elements.
  - 2. Install boards with a 1/4-inch setback where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- C. Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed exterior wall assembly.
- D. Apply fasteners so screw heads bear tightly against face of sheathing boards but do not cut into facing.

- E. Do not bridge building expansion joints with sheathing; cut and space edges to match spacing of structural support elements.
- F. Installation: Install board with edges centered over flanges of steel studs. Abut ends and edges of each board with those of adjacent boards. Screw-attach boards at perimeter and within field of board to each steel stud.
  - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.

### **3.2 SHEATHING JOINT-AND-PENETRATION TREATMENT**

- A. Seal sheathing joints according to sheathing manufacturer's written recommendations.
  - 1. Apply elastomeric sealant on joints and fasteners and trowel flat. Apply sufficient quantity of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
  - 2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing board joints, and apply and trowel silicone emulsion sealant to embed sealant in entire face of tape. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

**END OF SECTION**

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## SECTION 06 2000

### FINISH CARPENTRY

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Solid surfacing material (window sills and wall caps).
  - 2. Miscellaneous wood trim, including wall caps.
  - 3. Medium density fiberboard (MDF).
- B. Related Sections:
  - 1. Section 06 1053 "Miscellaneous Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
  - 2. Section 09 2216 "Non-Structural Metal Framing" for installation of sheet metal strips coordinated with spacing of finish plywood panel fasteners.
  - 3. Section 09 9100 "Painting" for finishing of wood components.
  - 4. Section 10 1400 "Signage" for acrylic panels.
  - 5. Section 12 3200 "Manufactured Cabinets and Casework" for solid surface countertops, millwork, and shop-built casework.

##### 1.3 SUBMITTALS

- A. Product Data: Provide product data for each type of factory-fabricated product and process specified, including details of construction relative to materials, dimensions of individual components, profiles, textures, and colors.
- B. Samples for Verification:
  - 1. For each species and cut of lumber and panel products with non-factory-applied finish, with 1/2 of exposed surface finished, 8 by 10 inches for panels.

##### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed finish carpentry similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
  - 1. Build mockup of MDF wall panel system as shown on Drawings or as directed by Architect.
  - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion

## **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.
- B. Environmental Conditions: Do not deliver interior finish carpentry until environmental conditions meet requirements specified for installation areas. If finish carpentry must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

## **1.6 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not deliver or install interior finish carpentry until building is enclosed and weatherproof, wet-work in space is completed and nominally dry, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels through the remainder of construction period.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS, GENERAL**

- A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," for lumber and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee Board of Review.
- B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:
  - 1. NHLA - National Hardwood Lumber Association.
  - 2. RIS - Redwood Inspection Service.
  - 3. SPIB - Southern Pine Inspection Bureau.
  - 4. WCLIB - West Coast Lumber Inspection Bureau.
  - 5. WWPA - Western Wood Products Association.
- C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
  - 1. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece, or omit grade stamps entirely and provide certificates of grade compliance issued by inspection agency.

### **2.2 MEDIUM-DENSITY FIBERBOARD**

- A. Materials, General: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
- B. Wood Moisture Content: 5 to 10 percent
- C. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
  - 1. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
    - a. Thickness: As indicated on Drawings.

## **2.3 SOLID-SURFACING-MATERIAL**

- A. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with material and performance requirements in ANSI Z124.3, for Type 5 or Type 6, without a precoated finish.
  - 1. Available Products: Subject to compliance with requirements of Contract Documents, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Corian; DuPont Polymers.
    - b. Solid Surfacing; Formica Corporation.
    - c. Staron; Lotte Advanced Materials
- B. Characteristics:
  - 1. Quality Standard: Comply with AWS Section 11 requirements.
  - 2. Grade: Custom.
  - 3. Solid-Surfacing-Material Thickness: 1/2 inch.
  - 4. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:
    - a. Provide Architect's selections from manufacturer's full range of colors and finishes.
- C. Fabricate window sills and wall caps in one piece with shop-applied edges, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
  - 1. Provide a dropped edge as indicated on Drawings at window sills and wall caps to cover raw edge of gypsum board.

## **2.4 MISCELLANEOUS MATERIALS**

- A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
  - 1. Where finish carpentry materials are exposed in areas of high humidity, provide fasteners and anchorages with hot-dip galvanized coating complying with ASTM A 153.
- B. Glue: Aliphatic or phenolic-resin wood glue recommended by manufacturer for general carpentry use.

## **2.5 FABRICATION**

- A. Wood Moisture Content: Comply with requirements of specified inspection agencies and manufacturer's recommendations for moisture content of finish carpentry on relative humidity conditions existing during time of fabrication and in installation areas.
- B. Fabricate finish carpentry to dimensions, profiles, and details indicated.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting installation and performance of finish carpentry. Do not proceed with installation until unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Clean substrates of projections and substances detrimental to application.
- B. Condition finish carpentry to average prevailing humidity conditions in installation areas before installation, for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.
- C. Prime and backprime lumber for painted finish. Comply with requirements for surface preparation and application in Division 9 Section "Painting."

### **3.3 INSTALLATION, GENERAL**

- A. Do not use finish carpentry materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
  - 1. Do not use manufactured units with defective surfaces, sizes, or patterns.
- B. Install finish carpentry plumb, level, true, and aligned with adjacent materials. Use concealed shims where required for alignment.
  - 1. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
  - 2. Countersink nails, fill surface flush, and sand where face nailing is unavoidable.
  - 3. Install to tolerance of 1/8 inch in 96 inches for plumb and level. Install adjoining finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
  - 4. Coordinate finish carpentry with materials and systems in or adjacent to standing and running trim and rails. Provide cutouts for mechanical and electrical items that penetrate exposed surfaces of trim and rails.
- C. Window Sills: Anchor securely by screwing through corner blocks or other supports into underside of window sills.
  - 1. Align adjacent solid-surfacing-material window sills and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
  - 2. Where windows are interior, provide solid-surfacing on both sides of the window unless a ceramic tile or wood window sill is indicated on the drawings.

### **3.4 WOOD STANDING AND RUNNING TRIM INSTALLATION - INCLUDING WALL CAPS**

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints, if required.
  - 1. Match color and grain pattern across joints.
  - 2. Install trim after gypsum board joint finishing operations are completed.
  - 3. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.



### **3.5 ADJUSTING**

- A. Repair damaged or defective finish carpentry where possible to eliminate functional or visual defects. Where not possible to repair, replace finish carpentry. Adjust joinery for uniform appearance.

### **3.6 CLEANING**

- A. Clean finish carpentry on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

### **3.7 PROTECTION**

- A. Provide final protection and maintain conditions that ensure finish carpentry is without damage or deterioration at the time of Substantial Completion.

**END OF SECTION**

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## **DIVISION 07 – THERMAL AND MOISTURE PROTECTION**

|                 |  |
|-----------------|--|
| Section 07 1113 | Bituminous Dampproofing                    |
| Section 07 1420 | Hot Fluid-Applied Waterproofing            |
| Section 07 1900 | Water Repellents                           |
| Section 07 2100 | Thermal Insulation                         |
| Section 07 2129 | Spray-On Acoustic Insulation System        |
| Section 07 2216 | Roof Insulation                            |
| Section 07 2726 | Fluid Applied Air, Water and Vapor Barrier |
| Section 07 4243 | Composite Metal Wall Panels                |
| Section 07 4293 | Metal Soffit Panels                        |
| Section 07 5419 | Polyvinyl-Chloride (PVC) Roofing           |
| Section 07 6200 | Sheet Metal Flashing and Trim              |
| Section 07 7200 | Roof Accessories                           |
| Section 07 8400 | Through-Penetration Firestop Systems       |
| Section 07 9200 | Joint Sealants                             |

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## SECTION 07 1113

### BITUMINOUS DAMPPROOFING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes cold-applied, emulsified asphalt dampproofing.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include recommendations for method of application, primer, number of coats, coverage or thickness, and protection course.
- B. Material Certificates: For each product, signed by manufacturers.

##### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain primary dampproofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials.

##### 1.5 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit asphalt dampproofing to be performed according to manufacturers' written instructions.
- B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has thoroughly cured.

#### PART 2 - PRODUCTS

##### 2.1 MANUFACTURERS

- A. **Available Manufacturers:** Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Cold-Applied, Emulsified-Asphalt Dampproofing:
    - a. Carlisle Coatings & Waterproofing; Barricoat-R, Roller Applied Waterproofing Membrane
    - b. Karnak Corporation; Fibered Dampproofing (brush or spray applied).
    - c. Sika/Master Builders Solutions: Masterseal 615

2. Protection Course, Asphalt-Board Type:
  - a. GCP Applied Technologies
  - b. W. R. Meadows, Inc.
  - c. Master Builders Solutions
  - d. Tamko.

## 2.2 BITUMINOUS DAMPPROOFING

- A. Odor Elimination: For interior and concealed-in-wall uses other than exterior face of inner wythe of cavity walls, provide dampproofing material warranted by manufacturer to be substantially odor free after drying for 24 hours under normal conditions.
  1. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise required.
- B. Cold-Applied, Emulsified-Asphalt Dampproofing:
  1. Trowel Coats: ASTM D 1227, Type II, Class 1.
  2. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.
  3. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.

## 2.3 MISCELLANEOUS MATERIALS

- A. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended by manufacturer.
- B. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.
- C. Protection Course, Asphalt-Board Type: Pre-molded, 1/8-inch- thick, multi-ply, semi-rigid board consisting of a mineral-stabilized asphalt core sandwiched between layers of asphalt-saturated felt, and faced on 1 side with polyethylene film.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, with Applicator present, for compliance with requirements for surface smoothness and other conditions affecting performance of work.
  1. Begin dampproofing application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.
- B. **Architect shall examine the installation** of dampproofing prior to backfilling. If backfilling occurs prior to Architect's examination, Contractor shall remove backfill, at Contractor's expense to allow for Architect's examination.

### 3.2 PREPARATION

- A. **Protection of Other Work:** Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.
- B. **Cleaning:** Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.

### **3.3 APPLICATION, GENERAL**

- A. Comply with manufacturer's written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.
  - 1. Apply additional coats if recommended by manufacturer or required to achieve coverages indicated.
  - 2. Allow each coat of dampproofing to cure 24 hours before applying subsequent coats.
  
- B. Apply dampproofing to footings **and foundation walls** whether indicated or not.
  - 1. Apply from finished-grade line to top of footing, extend over top of footing, and down a minimum of 6 inches over outside face of footing.
  - 2. Extend 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
  - 3. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch- wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat required for embedding fabric is in addition to other coats required.

### **3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING**

- A. Concrete Foundations: Apply two brush or spray coats at not less than 1.5 gallons/100 sq. ft. for first coat and 1 gallon/100 sq. ft. for second coat, one fibered brush or spray coat at not less than 3 gallons/100 sq. ft., or one trowel coat at not less than 4 gallons/100 sq. ft.
  
- B. Backs of Concrete Retaining Walls: Apply one brush or spray coat at not less than 1.25 gallons/100 sq. ft.
  
- C. Backs of Masonry Retaining Walls: Apply primer and one brush or spray coat at not less than 1.25 gallons/100 sq. ft.
  
- D. Exterior Face of Inner Wythe of Cavity Walls: Apply primer and one brush or spray coat at not less than 1 gallon/100 sq. ft.

### **3.5 INSTALLATION OF PROTECTION COURSE**

- A. Install protection course over completed-and-cured dampproofing where exposed to earth. Comply with dampproofing material manufacturer's written recommendations for attaching protection course. Support protection course with spot application of trowel-grade mastic where not otherwise indicated.

### **3.6 CLEANING**

- A. Remove dampproofing materials from surfaces not intended to receive dampproofing.

**END OF SECTION**

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## SECTION 07 1420

### HOT FLUID-APPLIED WATERPROOFING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Reinforced waterproofing membrane.
- B. Related Sections include the following:
  - 1. Section 07 2100 "Thermal Insulation" for rigid insulation.
  - 2. Section 07 9200 "Joint Sealants" for joint-sealant materials and installation.

##### 1.3 PERFORMANCE REQUIREMENTS

- A. Provide waterproofing that prevents the passage of water and complies with physical requirements in CAN/CGSB-37.50, "Hot Applied, Rubberized Asphalt for Roofing and Waterproofing."

##### 1.4 SUBMITTALS

- A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties.
- B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins to adjoining waterproofing, and other termination conditions.
- C. Samples: For the following products:
  - 1. 12-by-12-inch square of flashing sheet.
  - 2. 4-by-4-inch square of drainage panel.
- D. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.
- E. Product Test Reports: From a qualified independent testing agency indicating and interpreting test results of waterproofing for compliance with requirements, based on comprehensive testing of current waterproofing formulations.
- F. Sample Warranty: Copy of special waterproofing manufacturer's and Installer's warranty stating obligations, remedies, limitations, and exclusions before starting waterproofing.

##### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who is authorized, approved, or licensed to install waterproofing manufacturer's products; and who is eligible to receive waterproofing warranty specified.

- B. Source Limitations: Obtain waterproofing materials, sheet flashings, protection course, and drainage panels through one source from a single manufacturer.
- C. Mockups: Apply waterproofing to 100 sq. ft. of deck to demonstrate surface preparation, crack and joint treatment, corner treatment, thickness, texture, and execution quality.
  - 1. If Architect determines mockups do not comply with requirements, reapply waterproofing until mockups are approved.
  - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review requirements for waterproofing, including surface preparation specified under other Sections, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver liquid materials to Project site in original containers with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer.
- C. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- D. Protect stored materials from direct sunlight.

## **1.7 PROJECT CONDITIONS**

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate, or when temperature is below 0 degrees F.
  - 1. Do not apply waterproofing in snow, rain, fog, or mist.
- B. Maintain adequate ventilation during application and curing of waterproofing materials.

## **1.8 WARRANTY**

- A. Special Manufacturer's Warranty: Written warranty, signed by waterproofing manufacturer agreeing to repair or replace waterproofing and sheet flashings that do not comply with requirements or that do not remain watertight within specified warranty period.
  - 1. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate that exceed 1/8 inch in width.
  - 2. Warranty Period: 10 years after date of Substantial Completion.
- B. Special Installer's Warranty: Written waterproofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering Work of this Section, for warranty period of two years.
  - 1. Warranty includes removing and reinstalling protection board and drainage board, if any.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other acceptable manufacturers may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
1. Manufacturer: American Hydrotech, Inc.; Monolithic Membrane 6125.
  2. Product: Monolithic Membrane 6125.
- B. Acceptable Manufacturers: Subject to compliance with requirements, use products by one of the following manufacturers. If not listed, submit as a substitution as according to the Conditions of the Contract and requirements of Division 1 Sections.
1. American Hydrotech, Inc.
  2. Carlisle Corporation, Carlisle Coatings & Waterproofing Div.; CCW-500R.
  3. Carlisle; Miraseal 9100.
  4. Tremco; Tremproof 6100.

### **2.2 MEMBRANE**

- A. Single-component; 100 percent solids; hot fluid-applied, rubberized asphalt with the following properties measured per applicable test methods in CAN/CGSB-37.50:
1. Flash Point: Not less than 260 degrees C or not less than 25 degrees C above manufacturer's maximum recommended application temperature.
  2. Cone Penetration: 110 maximum at 25 degrees C, and 200 maximum at 50 degrees C.
  3. Flow: 3 mm maximum at 60 degrees C.
  4. Toughness: Not less than 5.5 J
  5. Ratio of Toughness to Peak Load: Not less than 0.040.
  6. Adhesion Rating: Pass.
  7. Water-Vapor Permeance: 1.7 ng/Pa x s x sq. m.
  8. Water Absorption: 0.35-g maximum mass gain, or 0.18-g maximum mass loss.
  9. Pinholing: Not more than one pinhole.
  10. Low-Temperature Flexibility: No cracking.
  11. Crack Bridging Capability: No cracking, splitting, or loss of adhesion.
  12. Heat Stability: Comply with requirements for penetration, flow, low-temperature flexibility, and viscosity when heated for five hours at manufacturer's recommended application temperature.
  13. Viscosity Test: 2 to 15 seconds.

### **2.3 AUXILIARY MATERIALS**

- A. Primer: ASTM D 41, asphaltic primer.
- B. Elastomeric Flashing Sheet: 50-mil- minimum, nonstaining, uncured sheet neoprene with manufacturer's recommended contact adhesives and predrilled metal termination bars and anchors, with the following physical properties as measured per standard test methods referenced:
1. Tensile Strength: 1400 psi minimum; ASTM D 412, Die C.
  2. Elongation: 300 percent minimum; ASTM D 412.
  3. Tear Resistance: 125 psi minimum; ASTM D 624, Die C.
  4. Brittleness: Does not break at minus 30 degrees F; ASTM D 2137.
- C. Sealants and Accessories: Waterproofing manufacturer's recommended sealants and accessories.

- D. Reinforcing Fabric: Manufacturer's recommended spun-bonded polyester fabric.
- E. Separator Sheet: ASTM D 4397, polyethylene sheet, minimum 4 mils thick.
- F. Protection Course: Semi-rigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:
  - 1. Thickness: 1/8 inch, nominal, for vertical applications; 1/4 inch, nominal, elsewhere.
  - 2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for type of protection course.

## 2.4 MOLDED-SHEET DRAINAGE PANELS

- A. Molded-Sheet Drainage Panel: Prefabricated, composite drainage panels, manufactured with a permeable geotextile facing laminated to a molded-plastic-sheet drainage core.
  - 1. Drainage Core: Three-dimensional, nonbiodegradable, molded-plastic-sheet material designed to effectively drain water under backfill pressure; complying with the following properties determined according to tests indicated:
    - a. Compressive Strength: 21,000 lbf/sf. ft., minimum; ASTM D 1621.
    - b. Flow Rate: 15 gpm per ft., minimum, at hydraulic gradient of 1.0 and compressive stress of 25 psi; ASTM D 4716.
  - 2. Geotextile: Woven geotextile fabric, manufactured for subsurface drainage, made from polyolefins or polyesters; with elongation less than 50 percent; complying with the following properties determined according to AASHTO M 288:
    - a. Survivability: Class 2.
    - b. Apparent Opening Size: No. 60 (0.25-mm) sieve, maximum.
    - c. Permittivity: 0.5 per second, minimum.
  - 3. Film Backing: Polymeric film bonded to drainage core surface.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. **Examine substrates, areas, and conditions**, with Installer present, for compliance with requirements and other conditions affecting performance.
  - 1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
  - 2. Verify that substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
- B. **Proceed** with installation **only after** unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean and prepare substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for waterproofing application.
- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.
- C. Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.

- D. Remove grease, oil, form-release agents, paints, curing compounds, and other penetrating **contaminants or film-forming coatings** from concrete.
  - 1. Abrasive blast clean concrete surfaces uniformly to expose top surface of fine aggregate according to ASTM D 4259 with a self-contained, recirculating, blast-cleaning apparatus. Remove material to provide a sound surface free of laitance, glaze, efflorescence, curing compounds, concrete hardeners, or form-release agents. Remove remaining loose material and clean surfaces according to ASTM D 4258.
- E. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.

### **3.3 JOINTS, CRACKS, AND TERMINATIONS**

- A. Prepare and treat substrates to receive waterproofing membrane, including joints and cracks, deck drains, corners, and penetrations according to CAN/CGSB-37.51, "Application of Rubberized Asphalt, Hot-Applied, for Roofing and Waterproofing," and waterproofing system manufacturer's written instructions.
  - 1. Rout and fill joints and cracks in substrate. Before filling, remove dust and dirt according to ASTM D 4258.
  - 2. Adhere elastomeric flashing sheet to substrate in a layer of hot, rubberized asphalt. Extend elastomeric flashing sheet a minimum of 6 inches (150 mm) on each side of joints and cracks and beyond deck drains, corners, and penetrations.
- B. At expansion joints and discontinuous deck-to-wall or deck-to-deck joints, bridge joints with elastomeric flashing sheet extended a minimum of 6 inches on each side of joints and adhere to substrates in a layer of hot, rubberized asphalt.

### **3.4 FLASHING INSTALLATION**

- A. Install flashing sheets at terminations of waterproofing membrane according to CAN/CGSB-37.51, "Application of Rubberized Asphalt, Hot-Applied, for Roofing and Waterproofing," and waterproofing system manufacturer's written instructions.
- B. Prime substrate with asphalt primer.
- C. Install elastomeric flashing sheet and adhere to deck and wall substrates in a layer of hot, rubberized asphalt.
- D. Extend flashing sheet up walls or parapets a minimum of 8 inches above plaza deck pavers and 6 inches onto deck to be waterproofed.
- E. Install termination bars and mechanically fasten to top of flashing sheet at terminations and perimeter of roofing.

### **3.5 MEMBRANE APPLICATION**

- A. Apply rubberized asphalt according to CAN/CGSB-37.51, "Application of Rubberized Asphalt, Hot-Applied, for Roofing and Waterproofing," and manufacturer's written instructions.
- B. Heat rubberized asphalt in an oil- or air-jacketed melter with mechanical agitator specifically designed for heating rubberized-asphalt waterproofing.

- C. Start application with manufacturer's technical representative present.
- D. Apply primer, at manufacturer's recommended rate, over prepared substrate and allow to dry.
- E. Reinforced Membrane: Apply waterproofing to substrates and adjoining surfaces indicated. Spread hot fluid-applied, rubberized asphalt to a thickness of 90 mils; embed reinforcing fabric, overlapping sheets 2 inches; and spread another 125-mil- thick layer to provide a uniform, reinforced, seamless membrane 215 mils thick.
- F. Apply waterproofing over prepared joints and up wall terminations and vertical surfaces to heights indicated or required by manufacturer.
- G. Cover waterproofing with separator sheet with overlapped joints while rubberized asphalt is still hot and before membrane is subject to traffic.
  - 1. Install protection course with overlapped joints over separator sheet..

### **3.6 MOLDED-SHEET DRAINAGE PANEL INSTALLATION**

- A. Place and secure molded-sheet drainage panels to substrate according to manufacturer's written instructions. Use adhesives that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.
  - 1. For vertical applications, install board insulation used as a protection course before installing drainage panels.

### **3.7 CURING, PROTECTING, AND CLEANING**

- A. Cure waterproofing according to manufacturer's written recommendations, taking care to prevent contamination and damage during application stages and curing.
  - 1. Do not permit foot or vehicular traffic on unprotected membrane.
- B. Protect waterproofing from damage and wear during remainder of construction period.
- C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction

**END OF SECTION**

## SECTION 07 1900

### WATER REPELLENTS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes clear water-repellent coatings for the following vertical and non-traffic horizontal surfaces:
  - 1. Exterior concrete masonry units (unpainted and unglazed).
- B. Related Sections include the following:
  - 1. Division 3 Sections for concrete work including floor sealers and curing agents.
  - 2. Section 04 2223 "Unit Masonry Assemblies" for concrete masonry.
  - 3. Section 07 9200 "Joint Sealants".
  - 4. Section 09 9100 "Painting" for paints and coatings, including treatment for interior masonry.

##### 1.3 PERFORMANCE REQUIREMENTS

- A. Provide water repellents with the following properties based on testing manufacturer's standard products, according to test methods indicated, applied to substrates simulating Project conditions using same materials and application methods to be used for Project.
- B. Masonry Sealer Requirements:
  - 1. Masonry Absorption: Minimum 98 percent reduction of absorption after 24 hours in comparison of treated and untreated specimens.
    - a. Concrete Unit Masonry: ASTM C 140.
  - 2. Water-Vapor Transmission: Maximum 10 percent reduction in rate of vapor transmission in comparison of treated and untreated specimens, per ASTM E 96.
  - 3. Water Penetration and Leakage through Masonry: Maximum 98 percent reduction in leakage rate in comparison of treated and untreated specimens, per ASTM E 514.
  - 4. Durability: Maximum 5 percent loss of water repellency after 2500 hours of weathering in comparison to specimens before weathering, per ASTM G 53.
  - 5. Permeability: Minimum 80 percent breathable in comparison of treated and untreated specimens, per ASTM D 1653.
  - 6. Chloride-Ion Intrusion in Concrete: Transportation Research Board, National Research Council's NCHRP Report 244, Series II tests.
    - a. Reduction of Water Absorption: 80 percent.
    - b. Reduction in Chloride Content: 80 percent.

##### 1.4 SUBMITTALS

- A. Product Data: Include manufacturer's specifications, surface preparation and application instructions, recommendations for water repellents for each surface to be treated, and protection and cleaning instructions. Include data substantiating that materials are recommended by manufacturer for applications indicated and comply with requirements.

- B. Samples: Of each substrate indicated to receive water repellent, 12 inches square, with specified repellent treatment applied to half of each sample.
- C. Applicator Certificates: Signed by manufacturer certifying that the applicator complies with requirements.

## 1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced applicator who employs only persons trained and approved by water repellent manufacturer for application of manufacturer's products.
- B. Source Limitations: Obtain the masonry sealer and the graffiti control product from a single manufacturer.

## 1.6 TEST PANELS

- A. Field Samples: Select multiple representative surfaces for each substrate to receive water repellents. Apply water repellent to each substrate, with either partial or full coverage as directed and in accordance with provisions in this Section. Comply with application requirements of this Section.
  - 1. Obtain Architect's approval of field samples before applying water repellents.
  - 2. Maintain field samples during construction in an undisturbed condition as a standard for judging the completed Work.
- B. Clean test panel area following substrate manufacturer's guidelines and recommended products for cleaning.
- C. After substrate has dried, ritem tube testing shall be done by manufacturer's representative, to determine coverage rates.
- D. Before full-scale application, review manufacturer's product data sheets to determine the suitability of each product for the specific surfaces. Apply each water repellent to test panels to determine number of applications, coverage rates, compatibility, effectiveness, surface preparation, application procedures, and desired results.
- E. Apply water repellents to test panels in accordance with manufacturer's written instructions. Allow 48 hours or until test panels are thoroughly dry before evaluating final appearance and results. A final ritem tube test shall be done to determine if desired finish has been accomplished. Do not begin full-scale application until test panels are inspected and approved by the Architect and the Manufacturer.
- F. Test Panel Requirements:
  - 1. Size: Minimum 4 feet by 4 feet each.
  - 2. Locations: As determined by the Architect.
  - 3. Number: As required to completely test each water repellent with each type of substrate to be protected.

## 1.7 PROJECT CONDITIONS

- A. Weather and Substrate Conditions: Do not proceed with application of water repellent under any of the following conditions, except with written instruction of manufacturer:
  - 1. Ambient temperature is less than 40 degrees F.
  - 2. Concrete surfaces and mortar have cured for less than 28 days.



3. Rain or temperatures below 40 degrees F are predicted within 24 hours.
4. Application is earlier than 24 hours after surfaces have been wet.
5. Substrate is frozen or surface temperature is less than 40 degrees F.
6. Windy condition exists that may cause water repellent to be blown onto vegetation or surfaces not intended to be coated.

## **1.8 WARRANTY**

- A. General: Special warranty specified in this Article shall not deprive Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of Contract Documents.
- B. Special Warranty: Submit a written warranty, executed by the applicator and water repellent manufacturer, covering materials and labor, agreeing to repair or replace materials that fail to provide water repellency within the specified warranty period. Warranty does not include deterioration or failure of coating due to failure of prepared and treated substrate, formation of new joints and cracks in excess of 1/16 inch wide, fire, vandalism, or abuse by maintenance equipment.
  1. Warranty Period: 5 years from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Basis of Design: Contract Documents are based on products specified in Part 3 schedules to establish a standard of quality. Other manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

### **2.2 WATER REPELLENTS**

- A. Material Compatibility: Provide primers, undercoats, and finish-coat materials that are compatible with one another and substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's highest grade of the various high-performance coatings specified. Materials not displaying manufacturer's product identification are not acceptable.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Clean substrate of substances that might interfere with penetration or performance of water repellents. Test for moisture content, according to repellent manufacturer's written instructions, to ensure surface is sufficiently dry.
- B. Test for pH level, according to water repellent manufacturer's written instructions, to ensure chemical bond to silicate minerals.

- C. Protect adjoining work, including sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live plants and grass.
- D. Coordination with Sealants: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.
  - 1. Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those used in the work.
- E. Test Application: Before performing water-repellent work, including bulk purchase and delivery of products, prepare a small application in an unobtrusive location that has been fully cleaned and in a manner approved by Architect to demonstrate the final effect (visual, physical, and chemical) of planned application. Proceed with work only after Architect approves test application or as otherwise directed.
  - 1. Revisions of planned application, if any, as requested by Architect, will be by Change Order if they constitute a departure from requirements of Contract Documents at the time of contracting.

### **3.2 APPLICATION**

- A. Application rate shall be in accordance with manufacturers written recommendations and in accordance with proper coverage rates for warranty requirements.
- B. Apply a heavy-saturation spray coating of water repellent on surfaces indicated for treatment using low-pressure spray equipment. Comply with manufacturer's written instructions for using airless spraying procedure, unless otherwise indicated.
- C. Apply a second saturation spray coating, repeating first application, if called for in the Water Repellent Schedule at the end of this section. Comply with manufacturer's written instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats. Consult manufacturer's technical representative if written instructions are not applicable to Project conditions.
- D. Apply coatings on the full height of the wall unless otherwise indicated.

### **3.3 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Service: Provide services of a factory-authorized technical service representative to inspect and approve the substrate before application and to instruct the applicator on the product and application method to be used.

### **3.4 CLEANING**

- A. Protective Coverings: Remove protective coverings from adjacent surfaces and other protected areas.
- B. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Repair damage caused by water-repellent application. Comply with manufacturer's written cleaning instructions.

### 3.5 EXTERIOR WATER REPELLENT SCHEDULE

- A. General: Provide the following systems for the various substrates, as indicated.
1. Masonry: 'Sure Klean Weather Seal Blok-Guard and Graffiti Control' or 'Sure Klean Weather Seal Blok-Guard and Graffiti Control II' as manufactured by Prosoco.
    - a. Vertical Applications: Apply with a "wet-on-wet" application to a visibly dry and absorbent surface.
      - 1) Saturate, "wet-on-wet" from the bottom up creating a 6"-8" rundown below the spray contact point. Avoid excessive overlapping.
      - 2) Let the first application penetrate the masonry surface for 2 to 3 minutes. For heavily textured and porous surfaces, re-apply in the same saturating manner to ensure complete coverage of recessed surfaces.
      - 3) Immediately brush out runs and drips to prevent build up.

**END OF SECTION**

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**SECTION 07 2100**  
**THERMAL INSULATION**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Foundation wall insulation (supporting backfill).
  - 2. Polyisocyanurate board insulation
  - 3. Concealed building insulation.
  - 4. Fire safing insulation.
  - 5. Spray applied polyurethane insulation.
  - 6. Acoustical fabric (behind perforated metal panels)
- B. Related Sections:
  - 1. Section 07 2129 "Spray-on Acoustic Insulation" for cellulose insulation used on exposed metal deck.
  - 2. Section 07 2216 "Roof Insulation" for insulation specified as part of roofing construction.

**1.3 SUBMITTALS**

- A. Product Data: Provide product data for each type of insulation product specified.
- B. Product Test Reports: Provide product test reports from and based on tests performed by a qualified independent testing agency evidencing compliance of insulation products with specified requirements including those for thermal resistance, fire-test-response characteristics, water-vapor transmission, water absorption, and other properties, based on comprehensive testing of current products.

**1.4 QUALITY ASSURANCE**

- A. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products complying with requirements indicated without delaying the Work.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated on Drawings or specified elsewhere in this Section as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
  - 1. Surface-Burning Characteristics: ASTM E 84.
  - 2. Fire-Resistance Ratings: ASTM E 119.
  - 3. Combustion Characteristics: ASTM E 136.

- C. Mock-Ups: Before installing building insulation, build a mockup in an area or room as directed by the Architect, for each insulation condition to be a standard for insulation installation.
1. Interior mock-up to include batt insulation, rigid insulation, spray-applied insulation, vapor barrier, conditions where insulation is covered with gypsum board and where insulation is to be left exposed such as above ceilings.
    - a. Apply spray-insulation a minimum of 48 inches W x full height of wall (floor slab to roof deck). Apply fire barrier products where required in permanent installation (do not install gypsum board over any area of mockup prior to Architect's review and approval).
    - b. Apply spray-insulation to area of spandrel glazing, as directed by Architect.
  2. Exterior Mock-up: Provide a mock-up of foundation insulation.
  3. Metal Wall Panels: Demonstrate fit and attachment of pre-sized rigid insulation in metal panel cavities.
  4. Approved mock-up may remain a part of the permanent construction, if undamaged prior to enclosure.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protection: Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect plastic insulation as follows:
1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
  2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
  3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering insulation products that may be incorporated in the Work include, but are not limited to, the following:
1. Extruded Polystyrene Board Insulation:
    - a. Kingspan.
    - c. DuPont de Nemours, Inc.
    - d. Owens-Corning Co.
  2. Glass-Fiber Insulation:
    - a. CertainTeed Corporation.
    - b. Knauf Fiber Glass GmbH.
    - c. Owens-Corning.
    - d. Johns Manville Corporation.
  3. Polyisocyanurate Board Insulation:
    - a. Atlas Products Company.
    - b. DuPont de Nemours, Inc.
    - c. Hunter Panels.
    - d. Johns Manville Corporation.
    - e. Carlisle Construction Materials.

4. Spray-applied Polyurethane Insulation:
  - a. Icynene MD-C-200.
  - b. NCFI, Division of Barnhardt Mfg. Co; InsulBloc 11-017
  - c. Heatlok HFO PRO, Huntsman Building Solutions.

## 2.2 INSULATING MATERIALS

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
- B. Extruded Polystyrene Board Insulation: (Perimeter insulation below grade) Rigid, cellular polystyrene thermal insulation formed from polystyrene base resin by an extrusion process using hydrochlorofluorocarbons as blowing agent to comply with ASTM C 578 for type and with other requirements indicated below:
  1. Type IV, 1.60-lb/cu. ft. minimum density, unless otherwise indicated.
  2. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 75 and 450, respectively.
  3. Recycled Content: Not less than 50 percent blend of post-consumer and recovered polystyrene resins.
  4. Thickness: 2 inches minimum.
- C. Unfaced Mineral-Fiber Blanket Insulation: (blankets without membrane facing). Thermal insulation combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665, Type I
  1. Mineral-Fiber Type: Fibers manufactured from glass.
  2. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 25 and 50, respectively.
  3. At 3 5/8 inch steel stud walls provide R-13 blankets, at 6 inch steel stud walls provide R-19 blankets and provide R-38 blankets at soffits, overhangs and roof exterior.
- D. Foil-Faced, Polyisocyanurate Board Insulation: (Cavity walls, exterior insulation above grade and furred CMU walls) ASTM C 1289, Type I, Class 1 or 2, with maximum flame-spread and smoke-developed indices of 75 and 450, respectively, based on tests performed on unfaced core on thicknesses up to 1 1/2 inches.
- E. Spray-Applied Polyurethane Insulation: Medium-density, closed cell product conforming to:
  1. Thermal Resistance (R-Value/inch): ASTM C518; 7.4 hr/sq ft/degree F/BTU, aged 90 days @ 140 deg. F.
  2. Air Permeance: ASTM E283; Less than 0.02 l/m2/second for 75 Pa for 1 inch thickness.
  3. Water Vapor Transmission: ASTM E96; 0.9 perms for 1.5 inches of material.
  4. Flame Spread and Smoke Developed Rating: ASTM E84; <20/<400.
  5. Thermal Barrier: The spray applied foam insulation must be separated from the interior of the building by an approved thermal barrier, such as 1/2-inch (min) gypsum wallboard installed using mechanical fasteners or on studs in accordance with the applicable code, or an equivalent 15-minute thermal barrier complying with the applicable code,
    - a. Ignition Barrier: When the insulation is installed within an attic space where entry is made only for service of utilities, an ignition barrier must be installed in accordance with IBC Section 2603.4.1.6. The ignition barrier must be consistent with the requirements for the type of construction required by the applicable code and must be installed in a manner so that the foam plastic insulation is not exposed. The ignition barrier may be an intumescent coating.

- b. Available Products-Intumescent Coating: Subject to compliance with requirements of Contract Documents, product which may be incorporated into the Work include, but are not limited to, the following:
  - 1) FireFree 88; International Fire Resistant Systems, Inc.
  - 2) SafeCoat Latex; Magna Coatings Technology Inc.
  - 3) Aldocoat 757; Aldo Products Company, Inc.
  - 4) DC-315; National Fireproofing, Inc

## 2.3 FIRE SAFING INSULATION AND ACCESSORIES

- A. Slag-Wool-Fiber Board Safing Insulation:
  - 1. Semi-rigid boards designed for use as fire stop at openings between edge of slab and exterior wall panels and other locations as required for fire stopping.
  - 2. Boards are to be produced by combining slag-wool fibers with thermosetting resin binders.
  - 3. Comply with ASTM C 612, Type IA and IB.
  - 4. Density: Nominal density of 4 lb/cu. ft.
  - 5. Safing to pass: ASTM E 136 for combustion characteristics; thermal resistivity of 4 degrees F x h x sq. ft./Btu x in. at 75 degrees F.
- B. Caulking Compound: Material approved by manufacturer of safing insulation for sealing joint between foil backing of safing insulation and edge of concrete floor slab against penetration of smoke.
- C. Safing Clips: Galvanized steel safing clips approved by manufacturer of safing insulation for holding safing insulation in place.

## 2.4 VAPOR RETARDERS

- A. Reinforced-Polyethylene Vapor Retarders: 2 outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nylon cord or polyester scrim and weighing not less than 25 lb/1000 sq. ft., with maximum permeance rating of 0.0507 perm.
- B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor retarder manufacturer for sealing joints and penetrations in vapor retarder.
- C. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Reinforced-Polyethylene Vapor Retarders:
    - a. DURA-SKRIM 6WW; Raven Industries, Inc.
    - b. Griffolyn T-65; Reef Industries, Inc., Griffolyn Div.

## 2.5 AUXILIARY INSULATING MATERIALS

- A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.



## 2.6 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation, of thickness indicated, securely in position indicated with self-locking washer in place; and complying with the following requirements:
  - 1. Plate: Perforated galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
  - 2. Spindle: Copper-coated low carbon steel, fully annealed, 0.105 inches in diameter, length to suit depth of insulation indicated.
- B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
  - 1. Where spindles will be exposed to human contact after installation, protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap.
- C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.
- D. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Adhesively Attached, Spindle-Type Anchors:
    - a. TACTOO Insul-Hangers; AGM Industries, Inc.
    - b. Spindle Type Gemco Hangers; Gemco.
  - 2. Anchor Adhesives:
    - a. TACTOO Adhesive; AGM Industries, Inc.
    - b. Tuff Bond Hanger Adhesive; Gemco.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected. The Architect shall examine the installation of the insulation prior to insulation being covered by other work. If insulation is covered prior to Architect's examination, Contractor shall remove other work, at contractor's expense to allow for Architect's examination.

### 3.2 PREPARATION

- A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or that interfere with insulation attachment.

### 3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, unsoiled, and has not been exposed at any time to ice and snow.

- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

### **3.4 INSTALLATION OF PERIMETER INSULATION (BELOW GRADE)**

- A. On vertical surfaces, set units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.

### **3.5 INSTALLATION OF GENERAL BUILDING INSULATION (ABOVE GRADE)**

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Seal joints between closed-cell (non-breathing) foam-plastic insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- C. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.
  - 1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.
  - 2. At locations where an exterior wall becomes an interior wall due to another exterior wall intersecting it on the exterior side, extend the vapor retarder 36 inches past the intersection of the walls.
- D. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:
  - 1. Use blanket widths and lengths that fill cavities formed by framing members. Where more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
  - 2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
  - 3. Insulation is to extend from floor to deck, typical.
- E. Install board insulation on concrete or masonry substrates by adhesively attached, spindle-type insulation anchors as follows:
  - 1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
  - 2. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
  - 3. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.
  - 4. Insulation is to extend from floor to deck, typical.

- F. Stuff glass-fiber loose-fill insulation into miscellaneous voids and cavity spaces. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.
- G. Apply sprayed-on acoustical insulation (for sound attenuation) according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make it even by using method recommended by insulation manufacturer.
  1. Thickness: Apply at a thickness as indicated on the Drawings or, if not indicated, apply at a thickness to achieve an NRC of 1.05 minimum.
  2. Cure insulation with continuous natural or mechanical ventilation.
  3. Remove and dispose of over-spray.
- H. Apply polyurethane spray insulation in accordance with manufacturer's written application instructions. Apply insulation to a uniform density without voids. Apply to minimum cured thickness to achieve a thickness of R-13. Touch-up, repair or replace damaged products before Substantial Completion

### **3.6 INSTALLATION OF SAFING INSULATION**

- A. Install safing insulation to fill gap between edge of concrete floor slab and back of exterior spandrel panels on safing clips spaced as needed to support insulation, but not further apart than 24 inches o.c. Cut safing insulation wider than gap to be filled to ensure compression fit and seal joint between insulation and edge of slab with calking approved by safing insulation manufacturer for this purpose. Leave no voids in completed installation.

### **3.7 INSTALLATION OF VAPOR RETARDERS**

- A. General: Extend vapor retarder 36 inches past extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- B. Seal vertical joints in vapor retarders over framing by lapping not less than 2 wall studs. Fasten vapor retarders to framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches o.c.
- C. Seal overlapping joints in vapor retarders with adhesives or vapor-retarder tape according to vapor retarder manufacturer's instructions. Seal butt joints and fastener penetrations with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
- D. Firmly attach vapor retarders to substrates with mechanical fasteners or adhesives as recommended by vapor retarder manufacturer.
- E. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.
- F. Repair any tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

### 3.8 PROTECTION

- A. **General:** *Protect* installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

**END OF SECTION**

## SECTION 07 2113.13

### FOAM BOARD INSULATION

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Foundation wall insulation (supporting backfill).

##### 1.3 SUBMITTALS

- A. Product Data: Provide product data for each type of insulation product specified.
- B. Product Test Reports: Provide product test reports from and based on tests performed by a qualified independent testing agency evidencing compliance of insulation products with specified requirements including those for thermal resistance, fire-test-response characteristics, water-vapor transmission, water absorption, and other properties, based on comprehensive testing of current products.

##### 1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products complying with requirements indicated without delaying the Work.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated on Drawings or specified elsewhere in this Section as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
  - 1. Surface-Burning Characteristics: ASTM E 84.
  - 2. Fire-Resistance Ratings: ASTM E 119.
  - 3. Combustion Characteristics: ASTM E 136.
- C. Mock-Ups: Before installing building insulation, build a mockup in an area or room as directed by the Architect, for each insulation condition to be a standard for insulation installation.
  - 1. Exterior Mock-up: Provide a mock-up of foundation insulation.
  - 2. Approved mock-up may remain a part of the permanent construction, if undamaged prior to enclosure.

##### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protection: Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

- B. Protect plastic insulation as follows:
  - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
  - 2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
  - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering insulation products that may be incorporated in the Work include, but are not limited to, the following:
  - 1. Extruded Polystyrene Board Insulation:
    - a. Kingspan.
    - c. DuPont de Nemours, Inc.
    - d. Owens-Corning Co.

### **2.2 INSULATING MATERIALS**

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
- B. Extruded Polystyrene Board Insulation: (Perimeter insulation below grade) Rigid, cellular polystyrene thermal insulation formed from polystyrene base resin by an extrusion process using hydrochlorofluorocarbons as blowing agent to comply with ASTM C 578 for type and with other requirements indicated below:
  - 1. Type IV, 1.60-lb/cu. ft. minimum density, unless otherwise indicated.
  - 2. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 75 and 450, respectively.
  - 3. Recycled Content: Not less than 50 percent blend of post-consumer and recovered polystyrene resins.
  - 4. Thickness: 2 inches minimum.

### **2.3 AUXILIARY INSULATING MATERIALS**

- A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected. The Architect shall examine the installation of the insulation prior to insulation being covered by other work. If insulation is covered prior to Architect's examination, Contractor shall remove other work, at contractor's expense to allow for Architect's examination.

### **3.2 PREPARATION**

- A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or that interfere with insulation attachment.

### **3.3 INSTALLATION, GENERAL**

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, unsoiled, and has not been exposed at any time to ice and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

### **3.4 INSTALLATION OF PERIMETER INSULATION (BELOW GRADE)**

- A. On vertical surfaces, set units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.

### **3.5 PROTECTION**

- A. General: Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

**END OF SECTION**

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**DIVISIONS 08 - 30**

Not Used

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**DIVISION 31**

Section 31 1000  
Section 31 2000

**EARTH WORK**

Site Clearing  
Earth Moving

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## SECTION 07 2129

### SPRAY-ON ACOUSTIC INSULATION SYSTEM

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. Section includes: Sprayed cellulose acoustical insulation.
- B. Related Items:
  - 1. Clips, hangers, supports, sleeves and other attachments to spray bases are to be placed by other trades prior to the application of sprayed insulation.
  - 2. Ducts, piping, conduit or other suspended equipment shall not be positioned until after the application of sprayed insulation.
  - 3. Roof penetrations to be installed prior to application.

##### 1.3 SUBMITTALS

- A. Submit product data that the product meets or exceeds the following specified requirements.
- B. Manufacturer's written certification that product contains no asbestos, fiberglass or other man-made mineral fibers.

##### 1.4 QUALITY ASSURANCE

- A. Manufacturer: Must have a current listing with ICC and must subscribe to independent laboratory follow-up inspection services of Underwriters Laboratories and Factory Mutual. Each bag shall be labeled accordingly.
- B. Applicator: Licensed by manufacturer.
- C. Mock-up: Apply a 100 square foot representative sample to be reviewed by the Architect and Owner prior to proceeding.
  - 1. Provide mockup in the location directed by Architect.
  - 2. Mockup shall be used to determine masking at joists and other surfaces as well as general aesthetic effect, thickness and other properties of completed installation.
    - a. Proper masking of adjoining surfaces is crucial to installation.
  - 3. Approved mockup may become part of the completed Work if undisturbed at time of Substantial Completion.

##### 1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver in original, unopened containers bearing name of manufacturer, product identification and reference to U.L. testing.
- B. Store materials dry, off ground, and under cover.

- C. Protect liquid adhesive from freezing.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other available manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
  - 1. Manufacturer: International Cellulose Corporation; [www.spray-on.com](http://www.spray-on.com).
  - 2. Product: K-13 Spray-On-Systems

### **2.2 MATERIALS**

- A. Spray applied cellulose insulation, with chemical treatment for fire retardance, and binding system for self-adhesion to surfaces.
  - 1. Minimum Fiber Recycled Content: 75 percent.
  - 2. No Urea-Formaldehyde resins.
  - 3. Color: White.
  - 4. Tested in accordance with ASTM E 1042. Testing laboratory must be NVLAP accredited.
- B. Properties:
  - 1. R-Value: 3.8 per inch per ASTM C 518.
  - 2. Bond Strength: Greater than 100 psf per ASTM E 736.
  - 3. Class 1 Class A per ASTM E 84/ UL 723.
  - 4. Non-corrosive per ASTM C 739.
  - 5. Bond Deflection per ASTM E 759: 6 inches deflection in 10 foot span - No Spalling or Delamination.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine surfaces and report unsatisfactory conditions in writing. Do not proceed until unsatisfactory conditions are corrected.
- B. Verify surfaces to receive spray insulation to determine if priming/sealing is required to insure bonding and/or to prevent discoloration caused by migratory stains.

### **3.2 PREPARATION**

- A. Provide masking, drop cloths and other satisfactory coverings for materials/surfaces that are not to receive insulation to protect from over-spray. Coordinate masking at structural joists and other surfaces with Architect. Overspray and misapplication of spray insulation will not be accepted.
- B. Coordinate installation of the sprayed cellulose fiber with work of other trades.
- C. Prime surfaces as required by manufacturer's instructions or as determined by examination.

### 3.3 INSTALLATION

- A. Thickness will be determined as the minimum thickness measured as per ASTM E-605 field test procedure.
- B. Install spray applied insulation according to manufacturer's recommendations.
- C. Install spray applied insulation to achieve an overall NRC of 0.70.

K-13 Sprayed Thermal & Acoustical Insulation ASTM C-423 on Solid Backing\*

| Inches | 125 HZ | 250 HZ | 500 HZ | 1000 HZ | 2000 HZ | 4000 HZ | NRC  |
|--------|--------|--------|--------|---------|---------|---------|------|
| 1.0    | 0.08   | 0.29   | 0.75   | 0.98    | 0.93    | 0.96    | 0.75 |
| 1.0**  | 0.47   | 0.90   | 1.10   | 1.03    | 1.05    | 1.03    | 1.00 |
| 2.0    | 0.26   | 0.68   | 1.05   | 1.10    | 1.03    | 0.98    | 0.95 |
| 3.0    | 0.57   | 0.99   | 1.04   | 1.03    | 1.00    | 1.00    | 1.00 |

K-13 Sprayed Thermal & Acoustical Insulation Applied to 1.5 inch Ribbed Metal Deck\*

| Inches | 125 HZ | 250 HZ | 500 HZ | 1000 HZ | 2000 HZ | 4000 HZ | NRC  |
|--------|--------|--------|--------|---------|---------|---------|------|
| 1.5    | 0.36   | 0.89   | 1.26   | 1.07    | 1.01    | 1.00    | 1.05 |
| 3.0    | 0.97   | 1.04   | 1.13   | 0.99    | 0.95    | 0.98    | 1.05 |

\*Some values interpolated    \*\*On lath

- D. Cure insulation with continuous natural or mechanical ventilation.
- E. Remove and dispose of over-spray.

### 3.4 PROTECTION

- A. Protect finished installation under provision of Division 1.

**END OF SECTION**

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## SECTION 07 2216

### ROOF INSULATION

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section

##### 1.02 SUMMARY

- A. This section includes, but is not limited to, the following:
  - 1. Preparation of new roof deck and all flashing substrates.
  - 2. Insulation
  - 3. Cover-board
  - 4. All related materials and labor required to complete specified roofing necessary to receive specified manufacturer's warranty.
- B. Related Sections
  - 1. Section 07 5419 "Polyvinyl-Chloride (PVC) Roofing" for roofing system and warranty requirements.
  - 2. Section 07 6200 "Sheet Metal Flashing and Trim" for trim components related to roofing system.

##### 1.03 ACTION SUBMITTALS

- A. Product Data Sheets: Submit manufacturer's product data sheets, installation instructions and/or general requirements for each component.
- B. Sample/Specimen Warranty from the manufacturer and contractor.
- C. Shop Drawings: Provide roof plan and applicable roof system detail drawings.

##### 1.04 INFORMATIONAL SUBMITTALS

- A. Contractor Certification: Submit written certification from roofing system manufacturer certifying that the applicator is authorized by the manufacturer to install the specified materials and system.

##### 1.05 CLOSEOUT SUBMITTALS

- A. Warranty: Provide manufacturer's and contractor's warranties upon substantial completion of the roofing system.

##### 1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
  - 1. Manufacture shall have 20 years of experience manufacturing roofing materials.
  - 2. Trained Technical Field Representatives, employed by the manufacturer, independent of sales.
  - 3. Provide reports in a timely manner of all site visit reports.
  - 4. Provide specified warranty upon satisfactory project completion.

- B. Contractor Qualifications:
  - 1. Contractor shall be authorized by the manufacturer to install specified materials prior to the bidding period through satisfactory project completion.
  - 2. Applicators shall have completed projects of similar scope using same materials as specified herein.
  - 3. Contractor shall provide full time, on-site superintendent or foreman experienced with the specified roof system through satisfactory project completion.
  - 4. Applicators shall be skilled in the application methods for all materials.
  - 5. Contractor shall maintain a daily record, on-site, documenting material installation and related project conditions.
  - 6. Contractor shall maintain a copy of all submittal documents, on-site, available at all times for reference.

#### **1.07 DELIVERY, STORAGE AND HANDLING**

- A. Refer to each product data sheet or other published literature for specific requirements.
- B. Deliver materials and store them in their unopened, original packaging, bearing the manufacturer's name, related standards, and any other specification or reference accepted as standard.
- C. Protect and store materials in a dry, well-vented, and weatherproof location. Only materials to be used the same day shall be removed from this location.
- D. When materials are to be stored outdoors, store away from standing water, stacked on raised pallets or dunnage, at least 4 in or more above ground level. Carefully cover storage with "breathable" tarpaulins to protect materials from precipitation and to prevent exposure to condensation.
- E. Properly dispose of all product wrappers, pallets, cardboard tubes, scrap, waste, and debris. All damaged materials shall be removed from job site and replaced with new, suitable materials.

#### **1.08 SITE CONDITIONS**

- A. Environmental Conditions:
  - 1. Monitor substrate temperature and material temperature, as well as all environmental conditions such as ambient temperature, moisture, sun, cloud cover, wind, humidity, and shade. Ensure conditions are satisfactory to begin work and ensure conditions remain satisfactory during the installation of specified materials. Materials and methods shall be adjusted as necessary to accommodate varying project conditions. Materials shall not be installed when conditions are unacceptable to achieve the specified results.
  - 2. Precipitation and dew point: Monitor weather to ensure the project environment is dry before, and will remain dry, during the application of roofing materials. Ensure all roofing materials and substrates remain above the dew point temperature as required to prevent condensation and maintain dry conditions.

#### **1.09 PERFORMANCE REQUIREMENTS**

- A. Fire Classification:
  - 1. Roof construction performance testing shall be in accordance with UL 1256, FM 4450 or FM 4470 to meet the specified requirements for interior flame spread and fuel contribution.
    - a. Roof construction meets requirements of UL 1256, or FM Class 1.

- B. Energy Conservation Requirements:
  - 1. Thermal Resistance 'R' for the specified roof insulation system shall include the continuous insulation (ci) above the roof deck.
    - a. Total Thermal Resistance R Value, continuous insulation (ci) above-deck: R-35 (minimum).

## **PART 2 - PRODUCTS**

### **2.01 ROOFING SYSTEM**

- A. Basis of Design: Contract Documents are based on product of manufacturer listed below to establish a standard of quality. Other available manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
  - 1. Manufacturer: Soprema
  - 2. Insulation Products: As approved by roofing system manufacturer and included in roofing warranty.

### **2.02 THERMAL INSULATION SYSTEM**

- A. Polyisocyanurate Insulation:
  - 1. Closed cell polyisocyanurate foam core bonded on each side to a glass fiber-reinforced felt facer.
    - a. Thickness: 5.3 in minimum board thickness. Total thickness to meet specified insulation system thermal resistance 'R' value of 35 (minimum).
    - b. Dimensions: 4 x 4 ft or 4 x 8 ft boards
    - c. Meets or exceeds ASTM C1289, Type II, Class 1, Grade 2 (20 psi).
  - 2. Tapered: Closed cell polyisocyanurate foam core bonded on each side to a glass fiber-reinforced felt facer, tapered to provide slope.
    - a. Taper: Insulation, crickets and saddles provided with taper as required for positive roof slope.
    - b. Dimensions: 4 x 4 ft boards
    - c. Meets or exceeds ASTM C1289, Type II, Class 1, Grade 2 (20 psi).
- B. Cover-Board Gypsum Roof Board Supplied by PVC Roofing Manufacturer
  - 1. National Gypsum Company, DEXcell FA Glass Mat Roof Board:
    - a. Gypsum core, glass fiber-faced, roof board:
    - b. Thickness: 5/8 in 1/2 in 1/4 in
    - c. Dimensions: 4 x 4 ft or 4 x 8 ft boards
    - d. Facer: Glass fiber.
    - e. Meets or exceeds ASTM C1177/C1177M.
  - 2. Georgia Pacific Gypsum LLC, DensDeck Prime Roof Board: Gypsum core, glass fiber-faced, factory primed, roof Cover-board.
    - a. Thickness: 5/8 in 1/2 in 1/4 in
    - b. Dimensions: 4 x 4 ft or 4 x 8 ft boards.
    - c. Facer: Factory primed, glass fiber.
    - d. Meets or exceeds ASTM C1177/C1177M.
- C. Insulation Fasteners And Plates
  - 1. #14 Fastener and Soprema 3 in Insulation Plate: Insulation system fasteners and metal stress plates.

- D. Polyurethane Foam Insulation Adhesive
  - 1. Two-component, polyurethane foam insulation adhesive, applied in ribbons from cartridges or two-component bulk packaging with pump-driven delivery system.
    - a. Ribbon size: 1/2 in to 3/4 in wide.
    - b. Ribbon spacing: As required to meet wind uplift resistance performance.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Examination includes visual observations, qualitative analysis, and quantitative testing measures as necessary to ensure conditions remain satisfactory throughout the project.
- B. Conduct qualitative insulation adhesive adhesion tests, or quantitative bonded pull tests as necessary to ensure satisfactory adhesion is achieved.
- C. The contractor shall examine all roofing substrates including, but not limited to: insulation materials, roof decks, walls, curbs, rooftop equipment, fixtures, and wood blocking.
- D. The applicator shall not begin installation until conditions have been properly examined and determined to be clean, dry and, otherwise satisfactory to receive specified roofing materials.
- E. During the application of specified materials, the applicator shall continue to examine all project conditions to ensure conditions remain satisfactory to complete the specified roofing system.

#### **3.02 PREPARATION**

- A. Before commencing work each day, the contractor shall prepare all roofing substrates to ensure conditions are satisfactory to proceed with the installation of specified roofing materials. Preparation of substrates includes, but is not limited to, substrate repairs, securement of substrates, eliminating all incompatible materials, and cleaning.
- B. Where conditions are found to be unsatisfactory, work shall not begin until conditions are made satisfactory to begin work. Commencing of work shall indicate contractor's acceptance of conditions.

#### **3.03 INSULATION FASTENER APPLICATION**

- A. Fasten (Polyiso Insulation) to the deck using specified insulation fasteners and plates.
- B. Fasten the insulation to meet the wind uplift resistance performance requirements and warranty requirements.

#### **3.04 INSULATION ADHESIVE APPLICATION**

- A. Two-Component Insulation Adhesive : Adhere Roof Cover Board
  - 1. Apply the specified two-component insulation adhesive to adhere Cover-board to the deck and insulation substrate.
  - 2. Follow insulation adhesive product data sheets and published general requirements for installation requirements.
  - 3. Apply insulation adhesive in uniform ribbons, 1/2 in to 3/4 in wide.

4. Immediately install insulation components into insulation adhesive, and apply weight to ensure the materials maintain full contact with all ribbons for complete adhesion. Do not allow insulation adhesive to skin-over before placing the insulation materials into the adhesive.
5. Adhere the insulation system to meet the specified wind uplift resistance performance and specified warranty requirements.
6. Minimum insulation adhesive ribbon spacing:
  - a. Field of Roof (Zone 1): 12 in on-centers.
  - b. Perimeter of Roof (Zone 2): 6 in on-centers.
  - c. Corners of Roof (Zone 3): 4 in on-centers.

### **3.05 CLEAN-UP**

- A. Clean-up and properly dispose of waste and debris resulting from these operations each day as required to prevent damages and disruptions to operations.

**END OF SECTION**

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## SECTION 07 2726

### FLUID APPLIED AIR, WATER, AND VAPOR BARRIER

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. Materials and installation for an air, water and vapor barrier membrane assembly within exterior wall assemblies as indicated on Drawings. System is to stop passage of air through and around:
  - 1. Joints between exterior walls and roof.
  - 2. Joints between walls and foundations.
  - 3. Seismic and expansion joints.
  - 4. Openings and penetrations of window frames, door frames, storefront and curtain wall.
  - 5. Piping, conduit, duct and other penetrations.
  - 6. Masonry ties, screws, bolts and similar projections
  - 7. All other air leakage pathways through opaque walls, including fascias, cornices, "eyebrow" projections and other areas of the building envelope.
- B. Related Sections: The following sections contain requirements that relate to this Section:
  - 1. Section 06 1053 "Miscellaneous Rough Carpentry" for plywood sheathing.
  - 2. Section 06 1643 "Gypsum Sheathing" for building sheathing.
  - 3. Section 07 9200 "Joint Sealants" for sealant materials and installation techniques.

##### 1.3 DEFINITIONS

- A. Air, Water, and Vapor Barrier: Air-tight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.
  - 1. Water Vapor Permeance: For purposes of conversion,  $57.2 \text{ ng}/(\text{Pa s sq m}) = 1 \text{ perm}$ .
  - 2. It is the intent of this specification that air and moisture barrier products shall be non-breathable. Provide only "non-breathable" products.

##### 1.4 REFERENCES

- A. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2007.
- B. ASTM E 2178 - Standard Test Method for Air Permeance of Building Materials; 2003.

## 1.5 SUBMITTALS

- A. Submittals prior to contract award:
  - 1. Installer Certification: Submit written certification from manufacturer certifying that Installer is approved by manufacturer to install specified system. Provide copy of certification to Architect before award of work.
  - 2. Certification that air and vapor barrier systems are *compatible with curtainwall and storefront systems* and do not void or otherwise impact curtainwall and storefront warranties.
  - 3. Certification that air and vapor barrier systems are compatible with curtainwall and storefront sealant systems.
  - 4. Certification that air and vapor barrier systems are compatible with adjacent sealants and assemblies.
  - 5. Letter from the primary roofing manufacturer stating that the proposed application will comply with the Manufacturer's requirements in order to qualify the project for the specified guarantee.
- B. Product data for each type of product specified. Include data substantiating that materials comply with requirements.
- C. Shop Drawings: Locations and extent of air and vapor barrier and details of typical and project-specific conditions, as required to provide a complete and continuous system.
- D. Manufacturer's installation instructions.
- E. Certification of compatibility by manufacturer, listing all materials on the Project with which the product and accessories may come in contact.
- F. Provide evidence of licensing and certification under the ABAA Quality Assurance Program.

## 1.6 QUALITY ASSURANCE

- A. Single-Source Responsibility: Obtain product and accessories from single manufacturer.
- B. Installer Qualifications:
  - 1. Specifically approved by manufacturer and experienced in application of product.
  - 2. Licensed and certified by Air Barrier Association of America (ABAA).
  - 3. Compliant with provisions of Owner's exterior commissioning program as outlined in Section 01 9115 "Facility Exterior Enclosure Commissioning".
- C. Pre-Installation/Construction Meetings: Convene one week prior to commencing Work of this section, in accordance with Section 01 3100 - Project Management and Coordination.
- D. Field-Constructed Mock-Ups: Prior to installation on Project, apply Product and Accessories on mock-up to verify details under shop drawing submittals, to demonstrate tie-ins with adjoining construction and other termination conditions and to become familiar with properties of materials in application.



- E. Mock-up: Building Envelope
  - 1. Air and moisture barrier system shall be included in free-standing building envelope mock-up as shown on Drawings.
  - 2. All air and moisture barrier work in envelope mock-up shall be performed by comparably skilled and experienced workers to those who will actually be performing the work for the Project
  - 3. Install air and moisture barrier in accordance with design documents and manufacturer's installation instruction, including joints with all pertinent materials. Air and moisture barrier shall be installed as proposed for actual construction of building.
  - 4. Air and moisture barrier system shall be removed and replaced with new if visual observation or testing demonstrates failure to conform to testing requirements or design intent.
  - 5. Approved mockups shall be retained intact and without damage throughout the construction process. Remove and dispose of properly off Owner's property and in accordance with the Waste Management Plan at Substantial Completion or when so directed by Architect.
  
- F. Preconstruction Field-Adhesion Testing: Before installing air, water, and vapor barrier, field test adhesion to Project joint substrates as follows:
  - 1. Locate tests where indicated on Project or, if not indicated, as directed by Architect.
  - 2. Conduct field tests for each application indicated below:
    - a. Each kind of substrate indicated.
  - 3. Notify Architect seven days in advance of dates and times when tests will be conducted.
  - 4. Arrange for tests to take place with air, water, and vapor barrier manufacturer's technical representative present.
  - 5. Perform tests in accordance with ASMT D4541 "Standard Test Method for Pull-off Strength of Coatings Using Portable Adhesion Testers" or other method required by air, water, and vapor barrier manufacturer demonstrating conformance to product requirements listed below.
  - 6. Report whether air, water, and vapor barrier or any barrier system components failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For adhesive failures, retest until satisfactory adhesion is obtained.
  - 7. Evaluation of Preconstruction Field-Adhesion-Test Results: Products not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use products that fail to adhere to joint substrates during testing.

## 1.7 WARRANTY

- A. Should all applicable building components be products of the same manufacturer, provide Carlisle NVELOP Plus warranty, covering roofing, roof insulation, vapor retarder, and below grade waterproofing systems.
- B. Warranty Period: 20 years from Substantial Completion.

## 1.8 FIELD CONDITIONS

- A. Do not apply product or accessories during rain.
- B. Apply product and accessories within approved ambient and substrate temperature range stated in Manufacturer's literature.

- C. Do not apply product or accessories over incompatible materials.

**1.9 PERFORMANCE REQUIREMENTS**

- A. Exhibit no visible water leakage when tested per ATM E331 and shall perform as a liquid water drainage plane flashed to discharge to the exterior any incidental condensation or water penetration.
- B. Perform as a vapor barrier, installed on the predominantly warm side of the insulation.
- C. Solvent free, have VOC content no greater than 30 grams per liter. Free of noxious odors.
- D. Product, when applied at minimum 0.040 inch (40 mils) cured thickness, shall meet the following requirements:

| <u>REQUIREMENT</u>             | <u>RESULT</u>  |
|--------------------------------|--|
| Air Permeance                  | Not more than 0.02 liters per second per square meter of area at 75 Pa pressure differential |
| Water Vapor Permeance          | Not more than 0.1 Perm   |
| Tensile Elongation             | Not less than 500 percent  |
| Low Temperature Flexibility    | No cracking, 180 degree bend over 1-inch mandrel at minus 20 degrees F                       |
| Low-Temperature Crack Bridging | Withstand 10 cycles at minus 15 degrees F  |
| Pull adhesion                  | Not less than 16 lb per square inch OR substrate failure                                     |

**PART 2 - PRODUCTS**

**2.1 VAPOR BARRIER**

- A. Air and Moisture Barrier: Cold-fluid-applied, water-based polymer-modified asphalt waterproofing membrane.
  - 1. Basis of Design: Contract Documents are based on products specified below to establish as standard of quality. Other acceptable manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
    - a. Manufacturer: Henry Company [www.henry.com](http://www.henry.com)
    - b. Products: Air Bloc 16MR
  - 2. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers listed below. If not listed, submit as a substitution according to the Conditions of the Contract and the requirements of Division 1 Sections.
    - a. Carlisle Coatings and Waterproof (CCW); [www.carlisle-ccw.com](http://www.carlisle-ccw.com).
    - b. Henry Company; [www.henry.com](http://www.henry.com)
    - c. Tremco; [www.tremcosealants.com](http://www.tremcosealants.com)
- C. Accessories: Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier material.
  - 1. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.
  - 2. Detail Flashing: 40 mil thickness, fire-resistant self-adhering flashing consisting of foil-faced glass laminated with fire-resistant butyl adhesive.

3. Transition Membrane: Pressure-sensitive, 90 mil composite membrane consisting of 60 mils un-cured EPDM laminated with 30 mils of synthetic rubber pressure-sensitive adhesive.
    - a. Provide preformed corners at curtain wall corners.
  4. Reinforcing Fabric: Air-barrier manufacturer's glass-fiber-mesh tape.
  5. Contact Adhesive: Air-barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.
  6. Mastic: LM 800 XL solvent-based synthetic rubber
- D. Related Accessories
1. Joint Sealant: Product approved by Manufacturer. Shall conform to ASTM C 920 Type 1 or 2, Grade NS, Class 25 or 50.
  2. Polyurethane Foam: One- or two-component, foamed-in-place, polyurethane foam sealant, 1.5- to 2.0-lb/cu. ft density; flame-spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verify that surfaces and conditions are clean and ready to accept the work of this section. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Verify that air, water and vapor barrier product is compatible with surfaces.
- C. Verify that wall assemblies are dried in, such that water intrusion will not occur from above, behind or around the air barrier installation.
- D. Concrete shall be cured for a minimum of seven days. It shall be smooth, with sharp protrusions such as form joints ground flush. Honeycomb and holes/cracks exceeding ¼ inch across shall be filled with grout or mortar.
- E. Surfaces shall be sound, dry and free of oil, grease, dirt, excess mortar or other contaminants.
- F. Surfaces shall be supported and flush at joints without large voids or sharp protrusions.
- G. Mortar joints shall be struck flush and shall be free of voids exceeding ¼ inch across. Mortar droppings shall be removed from brick ties and all other surfaces accepting air barrier.
- H. Sheathing boards shall be flush at joints, with gaps between boards according to building code and sheathing manufacturer's requirements. Sheathing boards shall also be securely fastened to the structure with proper fastener type, technique and spacing according to building code and sheathing manufacturer's requirements. Sheathing boards shall be repaired or replaced if inspection reveals moisture damage, mechanical damage or if sheathing boards have exceeded the exposure duration or exposure conditions as required by the sheathing manufacturer.
- I. Plywood, OSB, lumber or pressure-treated wood moisture content, measured with a wood moisture meter in the core of the substrate, shall be below 20 percent.

- J. Inform Architect in writing of:
  - 1. Cracks in concrete and masonry.
  - 2. Gaps or obstructions such as steel beams, angles, plates and projections which cannot be spanned or covered by Product or Accessories.
  - 3. Anticipated problems applying product and accessories over substrate.

### **3.2 PREPARATION**

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
- B. Treat sheathing joints with either:
  - 1. Sheathing joint treatment.
  - 2. Fill with joint sealant and strike flush.
- C. Prime sheathing if required by air, water, and vapor barrier manufacturer to assure adherence of barrier product.

### **3.3 INSTALLATION**

- A. Install materials in accordance with manufacturer's instructions.
- B. Air, Water, and Vapor Barrier: Install continuous air-tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- C. Coatings:
  - 1. Prepare substrate in manner recommended by coating manufacturer; fill and tape joints in substrate and between dissimilar materials.
  - 2. Where exterior masonry veneer is to be installed, install masonry anchors before installing weather barrier over masonry; seal around anchors airtight.
  - 3. Sprayed Coating: Install to thickness recommended by manufacturer.
  - 4. Use self-adhesive sheet flashing to seal to adjacent construction and to bridge joints.
- D. Openings and Penetrations in Exterior Weather Barriers:
  - 1. Install self-adhesive flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
  - 2. At openings to be filled with non-flanged frames, seal weather barrier to all sides of opening framing, using self-adhesive flashing at least 9 inches wide, covering entire depth of framing.
  - 3. At head of openings, install self-adhesive flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
  - 4. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
  - 5. Service and Other Penetrations: Form self-adhesive flashing around penetrating item and seal to weather barrier surface.

### **3.4 FIELD QUALITY CONTROL**

- A. Do not cover installed weather barriers until required inspections have been completed.

### **3.5 REPAIR AND PROTECTION**

- A. Protect from damage during application and remainder of construction period.
- B. Inspect before covering. Repair or replace damaged material according to Manufacturer's instructions and drawings.
- C. Product and accessories are not designed for permanent exposure. Cover with insulation or exterior cladding as soon as schedule allows.
- D. Outdoor exposure of installed transition membrane shall not exceed 60 days
- E. Outdoor exposure of installed product shall not exceed 30 days.

**END OF SECTION**

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## SECTION 07 4243

### COMPOSITE METAL WALL PANELS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. Section includes:
  - 1. Aluminum-faced composite wall panels (ACM) with concealed fastener assembly system.
  - 2. NO EXPOSED FASTENERS ALLOWED.
- B. Related Sections:
  - 1. Section 05 4200 "Cold-Formed Metal Framing" for installation of sheet metal strips coordinated with spacing of metal panel fasteners at exterior locations.
  - 2. Section 06 1643 "Gypsum Sheathing" for gypsum wall sheathing behind composite wall panel system.
  - 3. Section 07 2100 "Thermal Insulation" for exterior wall insulation.
  - 4. Section 07 2729 "Fluid-Applied Air, Water, and Vapor Barrier" for water-resistant air barrier on wall sheathing.
  - 5. Section 07 5419 "Polyvinyl-Chloride (PVC) Roofing" for wall caps and fascia furnished and warranted as part of the roofing system.
  - 6. Section 07 6200 "Sheet Metal Flashing and Trim" for flashings and other sheet metal work not part of metal wall panel assemblies. Verify sheet metal flashing and trim finish matches composite and metal panel wall panel systems.
  - 7. Section 07 9200 "Joint Sealants" for field-applied sealants not otherwise specified in this Section.

##### 1.3 DEFINITION

- A. Metal Wall Panel Assembly: Metal wall panels, attachment system components, miscellaneous metal framing, and accessories necessary for a complete system.

##### 1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide metal wall panel assemblies that comply with performance requirements specified as determined by testing manufacturers' standard assemblies similar to those indicated for this Project, by a qualified testing and inspecting agency.

- B. Structural Performance: Provide metal wall panel assemblies capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 330:
  - 1. Wind Loads: Determine loads based on the following minimum design wind pressures:
    - a. Uniform pressure as indicated on Drawings.
    - b. Maximum deflection of perimeter framing member of L/100 normal to plane of the wall; maximum deflection of individual panels of L/60.
    - c. Maximum anchor deflection in any direction of 1/16 inch at connection points of framing members to anchors.
    - d. Test Pressures: 150 percent of inward and outward wind-load design pressures.
- C. Seismic Performance: Provide metal wall panel assemblies capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."
- D. Thermal Movements: Provide metal wall panel assemblies that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.
- E. Fire Resistance Ratings: Comply with ASTM E119; testing by a qualified agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
- F. Fire Propagation Characteristics: Metal composite material wall panel system passes NFPA 285 testing.

## 1.5 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal wall panel and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of metal wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish between factory- and field-assembled work.
  - 1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches (1:10):
    - a. Flashing and trim.
    - b. Attachment system.
- C. Coordination Drawings: Exterior elevations drawn to scale and coordinating penetrations and wall-mounted items. Show the following:
  - 1. Wall panels and attachments.
  - 2. Stud framing.
  - 3. Wall-mounted items including doors, windows, louvers, and lighting fixtures.



- D. Samples for Selection: For each type of metal wall panel indicated with factory-applied color finishes.
  - 1. Include similar Samples of trim and accessories involving color selection.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for the following:
  - 1. Metal Wall and Soffit Panels: Include reports for air infiltration, water penetration, and structural performance.
  - 2. Furnish ICC-ES report for products.
- F. Maintenance Data: For metal wall panels to include in maintenance manuals.
- G. Warranties: Special warranties specified in this Section.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Fabricator Qualifications: Certified by metal-faced composite wall panel manufacturer to fabricate and install manufacturer's wall panel system.
  - 1. Delegated Design: Engage a qualified professional engineer to design composite metal panel system, including attachment system.
- C. Source Limitations: Obtain each type of metal wall panel through one source from a single manufacturer.
- D. Product Options: Drawings indicate size, profiles, and dimensional requirements of metal wall panels and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
  - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- E. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
  - 1. Build mockup of typical corner wall panel including soffit; approximately 48 inches square by full thickness, including insulation, supports, attachments, and accessories.
  - 2. Approval of mockups is for other material and construction qualities specifically approved by Architect in writing.
  - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
  - 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to metal wall panel assemblies including, but not limited to, the following:
  - 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, metal wall panel Installer, metal wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal wall panels including installers of doors, windows, and louvers.

2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal wall panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
6. Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable.
7. Review temporary protection requirements for metal wall panel assembly during and after installation.
8. Review wall panel observation and repair procedures after metal wall panel installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

### **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver components, sheets, metal wall panels, and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.
- B. Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal wall panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Protect strippable protective covering on metal wall panels from exposure to sunlight and high humidity, except to extent necessary for period of metal wall panel installation.

### **1.8 PROJECT CONDITIONS**

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal wall panels to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal wall panel fabrication and indicate measurements on Shop Drawings.
  1. Established Dimensions: Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating metal wall panels without field measurements, or allow for field trimming of panels. Coordinate wall construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

### **1.9 COORDINATION**

- A. Coordinate metal wall panel assemblies with rain drainage work, flashing, trim, and construction of studs, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

## 1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures, including rupturing, cracking, or puncturing.
    - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 2. Warranty Period: Five years from date of Substantial Completion.
  
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Finish Warranty Period: 20 years from date of Substantial Completion.
  
- C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace metal wall panel assemblies that fail to remain weather-resistant, within specified warranty period.
  - 1. Weathertight Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 ALUMINUM-FACED COMPOSITE WALL AND SOFFIT PANELS

- A. General: Provide factory-formed and -assembled metal-faced composite wall panels fabricated from two metal facings bonded, using no glues or adhesives, to solid extruded fire-retardant core; formed into profile for installation method indicated. Include attachment system components and accessories required for functional system.
  
- B. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers with products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. 3A Composites USA, Inc.; Alucobond Plus.
  - 2. Mitsubishi Composites America, Inc.; Alpolic/fr.
  - 3. Alcoa; Reynobond FR.
  
- C. Core: Noncombustible, with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
  - 1. Flame-Spread Index: 15 or less.
  - 2. Smoke-Developed Index: 105 or less.
  
- D. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch- thick aluminum sheet facings.
  - 1. Panel Thickness: 0.157 inch.
  - 2. Core: Fire retardant.
  - 3. Exterior Finish: Polyvinylidene fluoride (PDVF) two coat system
    - a. Colors as selected by Architect from manufacturer's full range.

- E. Attachment System Components: Formed from material compatible with panel facing.
  - 1. Two Piece Z-Furring: Custom-built, thermally-broken system, approximately 10 inches overall length, which allows adjustment of panels. Furring system to be designed and engineered by Fabricator.
  - 2. Hat channels where indicated on Drawings.
- F. Flashing and Trim: Same material, finish, and color as facings of adjacent composite panels, unless otherwise indicated.

## **2.2 ACCESSORIES**

- A. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels, unless otherwise indicated.
  - 1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal wall panels.
  - 2. Backing Plates: Provide pre-finished joint metal backing plates, fabricated from material recommended by manufacturer.
- B. Flashing and Trim: Formed from 0.062-inch- thick aluminum finished to match ACM. Provide flashing and trim as required to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal wall panels.

## **2.3 MISCELLANEOUS METAL FRAMING**

- A. Steel Sheet Components, General: Complying with ASTM C 645 requirements for metal and with ASTM A 653, G60, hot-dip galvanized zinc coating.
- B. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

## **2.4 MISCELLANEOUS MATERIALS**

- A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Conceal fasteners.

## **2.5 FABRICATION**

- A. General: Fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
  - 1. Form panel lines, breaks, and angles to be sharp and true, with surfaces free from warp and buckle.
- D. Aluminum-Faced Composite Wall Panels: Factory form panels in a continuous process with no glues or adhesives between dissimilar materials. Trim and square edges of sheets with no displacement of face sheets or protrusion of core material.
  - 1. Fabricate panels with sharply cut edges, with no displacement of face sheets or protrusion of core material. Bevel edge of panel to conceal core material when viewed from the exterior side.

2. Dimensional Tolerances:
  - a. Length and Width: plus or minus 1/16 inch.
  - b. Squareness (Diagonals): equal within 1/8 inch.
  
- E. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
  1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
  2. Conceal fasteners and expansion provisions. Exposed fasteners are not allowed on faces of accessories exposed to view.
  5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal wall panel manufacturer.
    - a. Size: As recommended by metal wall panel manufacturer for application but not less than thickness of metal being secured.

## 2.6 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
  
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
  
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
  
- D. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  1. Fluoropolymer Two- or Three-Coat System (Exposed Surfaces): Manufacturer's standard thermocured system consisting of specially formulated inhibitive primer complying with AAMA 2605.
    - a. Color: One custom color as selected by Architect.
    - b. Architect reserves the right to select a mica fluoropolymer or metallic fluoropolymer finish.
  2. Acrylic or Polyester System (Concealed Surfaces): Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of work.
  - 1. Examine wall framing to verify that studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
  - 2. Examine solid wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
  - 3. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
- B. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Miscellaneous Framing: Install base angles, sills, furring, and other miscellaneous wall panel support members and anchorage according to ASTM C 754 and metal wall panel manufacturer's written recommendations.
  - 1. Soffit Framing: Wire-tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.

### **3.3 ALUMINUM-FACED COMPOSITE WALL PANEL**

- A. General: Install attachment system required to support wall panels and to provide a complete weathertight wall system, including perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.
  - 1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.
  - 2. Do not begin installation until weather barrier and flashings that will be concealed by composite panels are installed.
- B. Comply with manufacturer's installation guides and Product Data, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation type selected.
- C. Work shall be done and completed in a thorough and workmanlike manner by mechanics skilled in their various trades.
- D. Caulk Installation:
  - 1. Use only approved sealants as described in Laminators Incorporated Installation Guidelines.
  - 2. The sealant manufacturer's instructions shall be followed in preparing and installing sealants.
  - 3. Joints to receive sealant shall be clean, dry and free from dust, grit and contaminants.
  - 4. The sealant shall completely fill the glazing pockets.

- E. Metal Soffit Panels: Provide metal soffit panels full width of soffits. Install panels perpendicular to support framing.
  - 1. Flash and seal panels as necessary to prevent trapping of water behind rain screen system where metal soffit panels meet walls and at perimeter of all openings.

### **3.4 ACCESSORY INSTALLATION**

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
  - 1. Install components required for a complete metal wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal composite material panel manufacturer; or, if not indicated, provide types recommended in writing by metal composite material panel manufacturer.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
  - 1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
  - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

### **3.5 ERECTION TOLERANCES**

- A. Installation Tolerances: Shim and align metal wall panel units within installed tolerance of 1/4 inch in 20 feet, noncumulative, on level, plumb, and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

### **3.6 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Services: Provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer's instructions.

### **3.7 CLEANING AND PROTECTION**

- A. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.
- B. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

**END OF SECTION**



## SECTION 07 4293

### METAL SOFFIT PANELS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Metal soffit panels.
  - 3. Provide components required for a complete soffit panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, seam covers, flashings, louvers, sealants, gaskets, fillers, closure strips, and similar items
- B. Related Sections include the following:
  - 1. Section 05 4200 "Cold-Formed Metal Framing" for exterior framing.
  - 2. Section 07 6200 "Sheet Metal Flashing and Trim" for flashings and other sheet metal work not part of metal soffit panel assemblies.
  - 3. Section 07 9200 "Joint Sealants" for field-applied sealants not otherwise specified in this Section.
  - 4. Section 09 2216 "Non-Structural Metal Framing" for installation of sheet metal strips coordinated with spacing of metal panel fasteners.

##### 1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide metal soffit panel assemblies that comply with performance requirements specified as determined by testing manufacturers' standard assemblies similar to those indicated for this Project, by a qualified testing and inspecting agency.
- B. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of soffit area when tested according to ASTM E 283 at a static-air-pressure difference of 6.24 lbf/sq. ft.
- C. Water Penetration: No water penetration when tested according to ASTM E 331 at a minimum differential pressure of 20 percent of inward-acting, wind-load design pressure of not less than 6.24 lbf/sq. ft. and not more than 12 lbf/sq. ft.
- D. Structural Performance: Provide metal soffit panel assemblies capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 330:
  - 1. Wind Loads: Determine loads based on the following minimum design wind pressures:
    - a. Uniform pressure as indicated on Drawings.
  - 2. Deflection Limits: Engineer metal soffit panel assemblies to withstand test pressures with deflection no greater than 1/240 of the span and no evidence of material failure, structural distress, or permanent deformation exceeding 0.2 percent of the clear span.
    - a. Test Pressures: 150 percent of inward and outward wind-load design pressures.

- E. Seismic Performance: Provide metal soffit panel assemblies capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."
- F. Thermal Movements: Provide metal soffit panel assemblies that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.

## **1.5 SUBMITTALS**

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal soffit panel and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of metal soffit panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish between factory- and field-assembled work.
  - 1. Accessories: Include details of flashing, trim and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10):
- C. Coordination Drawings: Exterior elevations drawn to scale and coordinating penetrations and soffit-mounted items. Show the following:
  - 1. Soffit panels and attachments.
  - 2. Stud framing.
  - 3. Soffit-mounted items including doors, windows, louvers, and lighting fixtures.
- D. Samples for Selection: For each type of metal soffit panel indicated with factory-applied color finishes.
  - 1. Include similar Samples of trim and accessories involving color selection.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for the following:
  - 1. Metal Soffit Panels: Include reports for air infiltration, water penetration, and structural performance.
- F. Maintenance Data: For metal soffit panels to include in maintenance manuals.
- G. Warranties: Special warranties specified in this Section.

## **1.6 QUALITY ASSURANCE**

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Fabricator Qualifications: Certified by metal-faced composite soffit panel manufacturer to fabricate and install manufacturer's soffit panel system.
- C. Source Limitations: Obtain each type of metal soffit panel through one source from a single manufacturer.

- D. Product Options: Drawings indicate size, profiles, and dimensional requirements of metal soffit panels and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- E. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
1. Build mockup of typical corner soffit panel; approximately 48 inches (1200 mm) square by full thickness, including insulation, supports, attachments, and accessories.
  2. Approval of mockups is for other material and construction qualities specifically approved by Architect in writing.
  3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
  4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to metal soffit panel assemblies including, but not limited to, the following:
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, metal soffit panel Installer, metal soffit panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal soffit panels including installers of doors, windows, and louvers.
  2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  3. Review methods and procedures related to metal soffit panel installation, including manufacturer's written instructions.
  4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
  5. Review flashings, special siding details, soffit penetrations, openings, and condition of other construction that will affect metal soffit panels.
  6. Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable.
  7. Review temporary protection requirements for metal soffit panel assembly during and after installation.
  8. Review soffit panel observation and repair procedures after metal soffit panel installation.
  9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

## **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver components, sheets, metal soffit panels, and other manufactured items so as not to be damaged or deformed. Package metal soffit panels for protection during transportation and handling.
- B. Unload, store, and erect metal soffit panels in a manner to prevent bending, warping, twisting, and surface damage.

- C. Stack metal soffit panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal soffit panels to ensure dryness, with positive slope for drainage of water. Do not store metal soffit panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Protect strippable protective covering on metal soffit panels from exposure to sunlight and high humidity, except to extent necessary for period of metal soffit panel installation.

## **1.8 PROJECT CONDITIONS**

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal soffit panels to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify locations of structural members and soffit opening dimensions by field measurements before metal soffit panel fabrication and indicate measurements on Shop Drawings.
  - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating metal soffit panels without field measurements, or allow for field trimming of panels. Coordinate soffit construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

## **1.9 COORDINATION**

- A. Coordinate metal soffit panel assemblies with rain drainage work, flashing, trim, and construction of studs, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

## **1.10 WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal soffit panel assemblies that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures, including rupturing, cracking, or puncturing.
    - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 2. Warranty Period: Five years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal soffit panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

- C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace metal soffit panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
1. Weathertight Warranty Period: Five years from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.1 PANEL MATERIALS**

- A. Metallic-Coated Steel Sheet Pre-painted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755.
1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653, G90 coating designation; structural quality.
  2. Surface: Smooth, flat finish.
  3. Exposed Finishes: Apply the following coil coating, as specified or indicated on Drawings.
    - a. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      - 1) Fluoropolymer Two-Coat System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat with color coat containing not less than 70 percent polyvinylidene fluoride resin by weight, complying with physical properties and coating performance requirements of AAMA 621, except as modified below:
        - (a) Humidity Resistance: 2000 hours.
        - (b) Water Resistance: 2000 hours.
  4. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.
- B. Panel Sealants:
1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
  2. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal soffit panels and remain weathertight; and as recommended in writing by metal soffit panel manufacturer.
  3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

### **2.3 MISCELLANEOUS METAL FRAMING**

- A. Steel Sheet Components, General: Complying with ASTM C 645 requirements for metal and with ASTM A 653, G60, hot-dip galvanized zinc coating.
- B. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

## 2.4 MISCELLANEOUS MATERIALS

- A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal soffit panels by means of plastic caps or factory-applied coating.
1. Fasteners for Soffit Panels: Self-drilling or self-tapping 410 stainless or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal soffit panels.
  2. Exposed Fasteners for Composite Panels: Stainless steel.
  3. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
  4. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
- B. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

## 2.5 METAL SOFFIT PANELS

- A. Metal Soffit Panels:
1. Basis-of-Design: Contract Documents are based on products specified below to establish a standard of quality. Other available manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
    - a. Manufacturer: MBCI Metal Roof and Soffit Systems, division of NCI Group, Inc.
    - b. Product: Artisan Series.
  2. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers with product which may be incorporated into the Work include, but are not limited to, the following:
    - a. ASC Profiles, a BlueScope Steel Company.
    - b. Centria Architectural Systems.
    - c. Fabral, Inc.
    - d. MBCI Metal Roof and Soffit Systems, division of NCI Group, Inc.
    - e. Morin, a Kingspan Group company.
    - f. MS Metal Sales Manufacturing Corporation.
- B. Characteristics:
1. Width: 4 inches nominal
  2. Gauge: 24 gauge. 40 k.s.i.
  3. Texture: Smooth, no ribs.
  4. Finish: Premium fluorocarbon coating produced with Kynar 500 or Hylar 5000 resin.
  5. Colors: Up to two (2) colors as selected by Architect from manufacturer's full range of colors.
- C. Provide 2 layers of R-19 batt insulation above soffit panels. Refer to Division 7 Section "Building Insulation" for insulation requirements.

## 2.6 ACCESSORIES

- A. Soffit Panel Accessories: Provide components required for a complete metal soffit panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal soffit panels, unless otherwise indicated.
1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal soffit panels.
  2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
  3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal soffit panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- B. Flashing and Trim: Formed from 0.0179-inch- thick, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endsoffits, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal soffit panels.

## 2.7 FABRICATION

- A. General: Fabricate and finish metal soffit panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
1. Form panel lines, breaks, and angles to be sharp and true, with surfaces free from warp and buckle.
- B. Fabricate metal soffit panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.
- C. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
  2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
  3. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
  4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
  5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal soffit panel manufacturer.
    - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal soffit panel manufacturer for application but not less than thickness of metal being secured.

## **2.8 FINISHES, GENERAL**

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal soffit panel supports, and other conditions affecting performance of work.
  - 1. Examine soffit framing to verify that studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal soffit panel manufacturer.
  - 2. Examine solid soffit sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal soffit panel manufacturer.
  - 3. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
- B. Examine roughing-in for components and systems penetrating metal soffit panels to verify actual locations of penetrations relative to seam locations of metal soffit panels before metal soffit panel installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Install flashings and other sheet metal to comply with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim."
- B. Install fasciae and copings to comply with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim."
- C. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous soffit panel support members and anchorage according to ASTM C 754 and metal soffit panel manufacturer's written recommendations.



### 3.3 METAL SOFFIT PANEL INSTALLATION, GENERAL

- A. General: Install metal soffit panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts, unless otherwise indicated. Anchor metal soffit panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Field cutting of metal soffit panels by torch is not permitted.
  2. Shim or otherwise plumb substrates receiving metal soffit panels.
  3. Rigidly fasten base end of metal soffit panels and allow eave end free movement due to thermal expansion and contraction. Pre-drill panels.
  4. Flash and seal metal soffit panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until weather barrier and flashings that will be concealed by metal soffit panels are installed.
  5. Install screw fasteners in pre-drilled holes.
  6. Locate and space fastenings in uniform vertical and horizontal alignment.
    - a. Minimize use of exposed fasteners.
  7. Install flashing and trim as metal soffit panel work proceeds.
  8. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
  9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
  10. Align bottom of metal soffit panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
  11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior soffits.
- B. Fasteners:
1. Steel Soffit Panels: Use stainless-steel fasteners for surfaces exposed to the exterior and galvanized steel fasteners for surfaces exposed to the interior.
  2. Fasteners shall be concealed to maximum extent possible.
  3. Heads of exposed fasteners shall be factory-painted to match siding.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal soffit panel manufacturer.
- D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal soffit panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal soffit panel manufacturer.
1. Seal metal soffit panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal soffit panel manufacturer.

### 3.4 FIELD-ASSEMBLED METAL SOFFIT PANEL INSTALLATION

- A. Lap-Seam Metal Soffit Panels: Fasten metal soffit panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.

2. Provide metal-backed washers under heads of fasteners bearing on weather side of metal soffit panels.
3. Locate and space fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain uniform controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
5. Provide sealant tape at lapped joints of metal soffit panels and between panels and protruding equipment, vents, and accessories.
6. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps, and on side laps of nesting-type panels; on side laps of corrugated nesting-type, ribbed, or fluted panels; and elsewhere as needed to make panels weatherproof to driving rains.
7. At panel splices, nest panels with minimum 6-inch end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.

### **3.5 ACCESSORY INSTALLATION**

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
  1. Install components required for a complete metal soffit panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
  1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
  2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

### **3.6 ERECTION TOLERANCES**

- A. Installation Tolerances: Shim and align metal soffit panel units within installed tolerance of 1/4 inch in 20 feet, non-accumulative, on level, plumb, and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

### **3.7 CLEANING AND PROTECTION**

- A. Remove temporary protective coverings and strippable films, if any, as metal soffit panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal soffit panel installation, clean finished surfaces as recommended by metal soffit panel manufacturer. Maintain in a clean condition during construction.
  
- B. Replace metal soffit panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

**END OF SECTION**

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## SECTION 07 5419

### POLYVINYL-CHLORIDE (PVC) ROOFING

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.02 SUMMARY

- A. This section includes, but is not limited to, the following:
  - 1. PVC membrane, adhered
  - 2. PVC membrane flashings, adhered
  - 3. Design of system to meet loading, including wind loading and uplift as outlined on Structural Drawings. All related materials and labor required to complete specified roofing necessary to receive specified manufacturer's warranty.
- B. Related Sections
  - 1. Section 07 2216 "Roof Insulation" for insulation and cover board to be included in roofing warranty.
  - 2. Section 07 6200 "Sheet Metal Flashing and Trim"

##### 1.03 ACTION SUBMITTALS

- A. Product Data Sheets: Submit manufacturer's product data sheets, installation instructions and general requirements for each component.
- B. Quality Compliance (QC)/Certificate of Analysis (COA): Submit manufacturers QC or COA signed by company's Quality Department certifying membrane materials meet the specified properties listed in the specification.
- C. Sample/Specimen Warranty from the manufacturer and contractor.
- D. Shop Drawings: Provide roof plan and applicable roof system detail drawings.
  - 1. Provide calculations and fastener and adhesive diagrams demonstrating compliance with requirements for wind loads and other roof forces.

##### 1.04 INFORMATIONAL SUBMITTALS

- A. Contractor Certification: Submit written certification from roofing system manufacturer certifying that the applicator is authorized by the manufacturer to install the specified materials and system.

##### 1.05 CLOSEOUT SUBMITTALS

- A. Warranty: Provide manufacturers and contractor's warranties upon substantial completion of the roofing system.

## **1.06 QUALITY ASSURANCE**

- A. Manufacturer Qualifications:
  - 1. Manufacturer shall have 20 years of experience manufacturing roofing materials.
  - 2. Trained Technical Field Representatives, employed by the manufacturer, independent of sales.
  - 3. Provide reports in a timely manner of all site visit reports.
  - 4. Provide specified warranty upon satisfactory project completion.
  
- B. Contractor Qualifications:
  - 1. Contractor shall be authorized by the manufacturer to install specified materials prior to the bidding period through satisfactory project completion.
  - 2. Applicators shall have completed projects of similar scope using same materials as specified herein.
  - 3. Contractor shall provide full time, on-site superintendent or foreman experienced with the specified roof system through satisfactory project completion.
  - 4. Applicators shall be skilled in the application methods for all materials.
  - 5. Contractor shall maintain a daily record, on-site, documenting material installation and related project conditions.
  - 6. Contractor shall maintain a copy of all submittal documents, on-site, available always for reference.

## **1.07 DELIVERY, STORAGE AND HANDLING**

- A. Refer to each product data sheet or other published literature for specific requirements.
  
- B. Deliver materials and store them in their unopened, original packaging, bearing the manufacturer's name, related standards, and any other specification or reference accepted as standard.
  
- C. Protect and store materials in a dry, well-vented, and weatherproof location. Only materials to be used the same day shall be removed from this location. During cold weather, store materials in a heated location, removed only as needed for immediate use.
  
- D. When materials are to be stored outdoors, store away from standing water, stacked on raised pallets or dunnage, at least 4 in or more above ground level. Carefully cover storage with "breathable" tarpaulins to protect materials from precipitation and to prevent exposure to condensation.
  
- E. Properly dispose of all product wrappers, pallets, cardboard tubes, scrap, waste, and debris. All damaged materials shall be removed from job site and replaced with new, suitable materials.

## **1.08 SITE CONDITIONS**

- A. Environmental Conditions:
  - 1. Monitor substrate temperature and material temperature, as well as all environmental conditions such as ambient temperature, moisture, sun, cloud cover, wind, humidity, and shade. Ensure conditions are satisfactory to begin work and ensure conditions remain satisfactory during the installation of specified materials. Materials and methods shall be adjusted as necessary to accommodate varying project conditions. Materials shall not be installed when conditions are unacceptable to achieve the specified results.

2. Precipitation and Dew Point: Monitor weather to ensure the project environment is dry before, and will remain dry, during the application of roofing materials. Ensure all roofing materials and substrates remain above the dew point temperature as required to prevent condensation and maintain dry conditions.
3. Hot-air Welding Application: Take all necessary precautions and measures to monitor conditions to ensure all environmental conditions are safe to proceed with the use hot-air welding equipment. Combustibles, flammable liquids, and solvent vapors that represent a hazard shall be eliminated and primers shall be fully dry before proceeding with hot air welding operations.

## 1.09 PERFORMANCE REQUIREMENTS

- A. Wind Uplift Resistance:
  1. Performance testing shall be in accordance with ANSI/FM 4474, FM 4450, FM 4470, UL 580 or UL 1897.
    - a. Roof System Design Pressures: Calculated in accordance with ASCE 7, or applicable standard.
- B. Fire Classification:
  1. Performance testing shall be in accordance with UL 790, ASTM E108, FM 4450 or FM 4470 to meet the 1/4:12 roof slope requirement.
    - a. Meets requirements of UL Class A or FM Class A.
  2. Performance testing shall be in accordance with UL 1256, FM 4450, or FM 4470 to meet the specified requirements for interior flame spread and fuel contribution.
    - a. Meets requirements of UL 1256, or FM Class 1.
- C. Impact Resistance:
  1. Performance testing for impact resistance shall be in accordance with FM 4450, FM 4470, or ASTM D4272 to meet the specified impact resistance requirements.
    - a. Meets requirements for FM- Very Severe Hail (VSH).
- D. Photo-Voltaic System: Roofing system shall be designed to allow installation of a photo-voltaic system either as part of the initial construction effort or as a future project (refer to section 01 2300 "Alternates", Alternate #1). Warranty shall be written to accommodate presence of a photo-voltaic system, without diminishing provisions as listed below.

## 1.10 WARRANTY

- A. Manufacturer's No Dollar Limit (NDL) Warranty: Provide the Owner with the manufacturer's warranty providing labor and materials for 30-years from the date the warranty is issued. Warranty shall include blocking, roofing insulation, cover board, and flashing and trim provided by or necessary to the roofing system.
- B. Contractor" Warranty: Provide the Owner with warranty covering workmanship for a period of 2 years from completion date.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Basis of Design: Contract Documents are based on product of manufacturer listed below to establish a standard of quality. Other acceptable manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
1. Manufacturer: Soprema: [www.soprema.us](http://www.soprema.us)
  2. System: Fully adhered 80 mil membrane system.
- B. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide systems by one of the following manufacturers:
1. Sika
  2. Soprema
  3. Johns-Manville
  4. Garland.

### **2.02 ADHERED PVC MEMBRANE**

- a. Polyester reinforced, thermoplastic polyvinyl chloride (PVC) membrane with a smooth back underside.
1. Overall Thickness ASTM D4434 (ASTM D638): 80 mils minimum
    - a. Manufacturer shall provide membrane at specified minimum 80 mils
    - b. ASTM D4434 +/- tolerance for membrane thickness will not be accepted.
  2. Thickness over Scrim (ASTM D7635): 40 mils minimum
    - a. Manufacturer shall provide membrane with minimum 40 mils compound thickness above reinforcement/scrim
  3. Width: 10 feet
  4. Length: 65 feet
  5. Physical Properties ASTM D4434.
    - a) Breaking Strength, lbf/in: 460 (MD) 330 (XMD)
    - b) Elongation at Break %: 25 (MD) 25(XMD)
    - c) Tear Strength, lbf: 170 (MD) 80 (XMD)
    - d) Linear Dimensional Change - %: <0.1%
  6. Color: White

### **2.03 ACCESSORIES**

- A. Membrane Adhesives:
1. Bonding Adhesive: Solvent-based adhesive. Formulated to adhere smooth back PVC membranes.
    - a. VOC Content: 199.5 g/L or less.
  2. H2O Bonding Adhesive: Waterborne polymeric adhesive. Formulated to adhere smooth and fleece back PVC membranes.
    - a. VOC Content: 179.0 g/L or less.



- B. Flashing Adhesives:
1. Bonding Adhesive: Solvent-based adhesive. Formulated to adhere smooth back PVC flashings.
    - a. VOC Content: 199.5 g/L or less.
- C. Sealants:
1. Universal Sealant: Gun grade, moisture curing, polyether, elastomeric sealant for PVC membrane terminations.
    - a. VOC Content: 20 g/L or less
    - b. Meets or exceeds ASTM C920, Type S, Grade NS, Class 25
    - c. Color: White
  2. Butyl Sealant Tape: Butyl rubber and polyisobutylene water resistant sealant tape for concealed sheet metal joints and water cutoff.
  3. Butyl Sealant: Butyl rubber and polyisobutylene water resistant sealant for concealed sheet metal joints and water cutoff.
- D. Membrane Fasteners and Plates
1. SOPRAPHIX® #15 HD Fastener: Membrane fastener.
  2. SOPRAPHIX® 2 IN STRESS PLATE: Membrane seam plate.
  3. SOPRAPHIX® 2.4 IN STRESS PLATE: Membrane seam plate.
- E. Membrane Accessories:
1. 60 MIL PVC Detailing Membrane: Fiberglass reinforced, thermoplastic polyvinyl chloride (PVC) membrane with a smooth back underside.
    - a. Overall Thickness ASTM D4434 (ASTM D638): 60 mils minimum
      1. Colors: White
      2. Size: 2.5 ft x 100 ft (0.76 m x 30 m)
  2. Molded Outside Corner: Injection Molded Corner
    - a. Color: White
  3. Molded Inside Corner: Injection Molded Corner
    - a. Color: White
  4. PVC Prefabricated Outside Corner: Prefabricated Outside Corner
    - a. Color: White
  5. PVC Prefabricated Inside Corner: Prefabricated Inside Corner
    - a. Color: White
  6. SENTINEL® T-Joint Patches: 4.5 in Round T-Joint Patch
    - a. Color: White
  7. SENTINEL® PVC Pipe Flashing: Prefabricated PVC pipe flashing.
    - a. Size: as required.
    - b. Color: White
  8. SENTINEL® Walkway Pad: PVC walkway protection mat.
    - a. Width: 30 in
    - b. Length: 50 ft
    - c. Color: Grey
- F. Sheet Metal Flashing:
1. Contractor shall furnish all sheet metal flashings, counter flashings, roof edge system, and all other related sheet metal flashings and associated fasteners necessary to flash and counter flash the specified roofing system.
  2. Sheet metal flashing materials and fasteners shall be compatible with adjacent materials, to accommodate all project related exposures.

3. Vinyl Coated Metal: 24-gauge galvanized sheet steel with a 20 mil, UV-resistant PVC coated topside.
    - a. SOPREMA® SENTINEL® VCM: PVC coated metal.
      1. Width: 4 ft (1.219 m)
      2. Length: 10 ft (3.048 m)
      3. Color: White
  4. Roof Edge System: Tested per ANSI/SPRI ES-1 to meet or exceed design pressures at roof edge.
- G. Liquid-Applied Reinforced Flashing System: Contractor Option
1. ALSAN® RS 230 FLASH, Catalyzed polymethyl methacrylate (PMMA) resin with polyester reinforcing fleece fabric fully embedded into the resin to form fully reinforced waterproofing membrane flashings.
    - a. VOC Content: No VOC content.
    - b. SOPREMA® ALSAN® RS 230 FLASH: Polymethyl methacrylate (PMMA) liquid resin.
    - c. SOPREMA® ALSAN® RS CATALYST POWDER: Reactive agent added to the PMMA liquid resin to induce curing.
    - d. SOPREMA® ALSAN® RS FLEECE: Polyester reinforcement fabric.
    - e. Color: Flash color and finish to match Field.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Examination includes visual observations, qualitative analysis, and quantitative testing measures as necessary to ensure conditions remain satisfactory throughout the project.
- B. The contractor shall examine all roofing substrates including, but not limited to: insulation materials, roof decks, walls, curbs, rooftop equipment, fixtures, and wood blocking.
- C. The applicator shall not begin installation until conditions have been properly examined and determined to be clean, dry and, otherwise satisfactory to receive specified roofing materials.
- D. During the application of specified materials, the applicator shall continue to examine all project conditions to ensure conditions remain satisfactory to complete the specified roofing system.

### **3.02 PREPARATION**

- A. Before commencing work each day, the contractor shall prepare all roofing substrates to ensure conditions are satisfactory to proceed with the installation of specified roofing materials. Preparation of substrates includes, but is not limited to, substrate repairs, securement of substrates, eliminating all incompatible materials, and cleaning.
- B. Where conditions are found to be unsatisfactory, work shall not begin until conditions are made satisfactory to begin work. Commencing of work shall indicate contractor's acceptance of conditions.
- C. Determine, in consultation with manufacturer, Owner, General Contractor, and Architect, the most appropriate adhesive system for application.

### **3.03 HOT-AIR WELDING**

- A. Hot air shall be used to seal membrane side and end laps. Refer to NRCA CERTA, local codes and building owner's requirements for hot work operations.
- B. Position the membrane so that it overlaps the adjacent membrane at the required side lap width. Ensure the laps are dry, clean, and free of foreign material.
- C. Weld the laps together with an automatic welding machine or hand welder maintaining a minimum 1.5 in continuous weld. All seams shall be inspected for a continuous weld.
- D. At end-laps of bare back membranes, round the corners by cutting a radius on both corners.
- E. Fleece back membrane end laps shall be butted to one another and a 6 in membrane cover strip welded on top.
- F. SOPREMA® T-JOINT PATCHES shall be hot-air welded to the membrane at all t-joint intersections. Chamfer the welding seam prior to installing T-Joint patches using an edging tool or by heating the edge and rolling.

### **3.04 ADHERED MEMBRANE APPLICATION (SENTINEL® S BONDING ADHESIVE)**

- A. The ambient temperature shall be above 50°F (10°C).
- B. SOPREMA® SENTINEL® S BONDING ADHESIVE may be applied using a 3/8 in nap solvent resistant roller.
- C. Apply adhesive to clean, dry, and prepared compatible substrates as required to ensure full adhesion at the application rate published on the product data sheet.
- D. Apply adhesive to the underside of the bare back membrane at the application rate published on the product data sheet.
- E. Allow the adhesive on both surfaces to dry to a tacky feel when touched with a dry finger.
- F. Mate the membrane to the substrate avoiding any air entrapment or wrinkles and apply pressure with a roller or push broom to ensure complete bonding.
- G. At the end of the sheet where it terminates at roof edges, walls, and curbs, fasten the perimeter of the membrane with appropriate fasteners and seam plates to the deck or vertical surface at the base of the upstand.
- H. Hot air weld all side and end laps.
- I. At PVC terminations at roof edges, walls, and curbs, fasten the perimeter edge of the membrane with appropriate fasteners, seam plates or flat termination bars to the horizontal deck or vertical substrate along the termination.

- J. Fasten membrane termination 12 in on-centers maximum along membrane terminations. Locate the edge of the fastener plate 1 in or more back from the edge of the membrane.
- K. Probe all seams/laps once the hot air welds have thoroughly cooled.
- L. Repair all seam deficiencies the same day they are discovered.

### **3.05 ADHERED MEMBRANE APPLICATION (SENTINEL® H2O BONDING ADHESIVE)**

- A. The ambient temperature shall be above 50°F (10°C).
- B. SOPREMA® SENTINEL® H2O BONDING ADHESIVE may be applied using a 3/8 in nap solvent resistant roller.
- C. Apply adhesive to clean, dry, and prepared compatible substrates only as required to ensure full adhesion.
- D. Apply a uniform application of membrane adhesive at the application rate published on the product data sheet.
- E. Mate the membrane to the substrate while the adhesive is wet avoiding any air entrapment or wrinkles. Apply pressure with a roller or push broom to ensure complete bonding.
- F. Hot air weld all side and end laps.
- G. At PVC terminations at roof edges, walls, and curbs, fasten the perimeter edge of the membrane with appropriate fasteners, seam plates or flat termination bars to the horizontal deck or vertical substrate along the termination.
- H. Fasten membrane termination 12 in on-centers maximum along membrane terminations. Locate the edge of the fastener plate 1 in or more back from the edge of the membrane.
- I. Probe all seams/laps once the hot air welds have thoroughly cooled.
- J. Repair all seam deficiencies the same day they are discovered.

### **3.06 PVC FLASHING MEMBRANE APPLICATION**

- A. Follow material product data sheets and published general requirements for installation instructions.
- B. Ensure field membrane is fastened and secure to the substrate at all membrane terminations before PVC flashing is installed.
- C. Ensure PVC membrane and substrates are dry, clean, and free of asphalt and all bitumen-based products. Do not allow bare PVC to meet asphalt or bitumen-based products.
- D. Where required, cover walls and other flashing substrates using specified wood, gypsum or cement roof boards securely fastened in place.

- E. The ambient temperature shall be above 40°F (4.4°C) during adhesive application. Ensure temperature is well above the dew point temperature to prevent condensation during adhesive application.
- F. Apply SOPREMA® SENTINEL® S BONDING ADHESIVE using 3/8 in nap solvent resistant rollers to clean, dry and prepared flashing substrates, and onto the underside of the bare PVC membrane. Refer to product data sheet for application rate.
- G. Prevent adhesive from contacting the membrane at the side and end-laps that are to be hot-air welded.
- H. Allow the adhesive on both surfaces to dry to the touch. Adhesive may be tacky to-the-touch, but not wet. Adhesive should not transfer to the fingertips when touched.
- I. Mate the PVC flashing membrane to the flashing substrate. Prevent air entrapment and wrinkles. Apply pressure with hands, roller, or broom to ensure complete adhesion.
- J. Hot air weld all laps with minimum 1-1/2 in welds.
- K. Probe all seams/laps once the hot air welds have thoroughly cooled.
- L. Repair all seam deficiencies the same day they are discovered
- M. Fasten top leading edge of vertical PVC flashings. Refer to detail drawings.

### **3.07 LIQUID-APPLIED, ALSAN RS 230 PMMA MEMBRANE AND FLASHING SYSTEM APPLICATION**

- A. Refer to manufacturer's details drawings, product data sheets and published general requirements for application rates and specific installation instructions.
- B. PVC membrane preparation:
  1. Ensure the PVC field membrane is fastened and secure to the substrate at all membrane terminations before liquid-applied flashing is installed.
  2. Install a welded PVC cover-strip over fasteners where applicable. Ensure cover-strip is welded tight, with no loose ends or open laps.
  3. Ensure PVC membrane and substrates are dry, clean, and free of asphalt and all bitumen-based products. Do not allow bare PVC to meet asphalt or bitumen-based products.
  4. Lightly abrade the PVC membrane surface where liquid-applied membrane is to be applied.
  5. Wipe PVC membrane surface clean using ALSAN® RS CLEANER and allow too fully dry.
- C. Pre-cut SOPREMA® ALSAN® RS FLEECE polyester reinforcing fleece to conform to roof terminations, transitions and penetrations being flashed. Ensure a minimum 2 in overlap of fleece at side and end-laps. Ensure the completed liquid-applied flashing membrane is fully reinforced.
- D. Apply the base coat of catalyzed SOPREMA® ALSAN® RS resin onto the substrate using a brush or roller, working the material into the surface for complete coverage and full adhesion.

- E. Immediately apply the SOPREMA® ALSAN® RS FLEECE reinforcing into the wet base coat of resin. Using a brush or roller, work the SOPREMA® ALSAN® RS FLEECE reinforcing fabric into the wet resin while applying the second coat of catalyzed SOPREMA® ALSAN® RS resin to completely encapsulate the fleece.
- F. Refer to reinforced, polymethyl-methacrylate specification section and application instructions, details drawings, product data sheets and published general requirements for complete installation instructions.

### **3.08 SHEET METAL FLASHING APPLICATION**

- A. Refer to sheet metal flashing detail drawings and follow product data sheets and published general requirements for installation instructions.
- B. Follow the most recent edition of the SMACNA Architectural Sheet Metal Manual for fabrication and installation requirements.

### **3.09 WALKWAYS**

- A. At areas outlined on the drawings, and around the perimeter of all rooftop equipment and at all door and stair landings, install walkway protection.
- B. Cut walkway from end of SOPREMA® SENTINEL® WALKWAY PAD.
- C. Hot air weld the entire perimeter of the SOPREMA® SENTINEL® WALKWAY PAD to the membrane.
- D. Coordinate walkways with photo-voltaic system.

### **3.10 CLEAN-UP**

- A. Clean-up and properly dispose of waste and debris resulting from these operations each day as required to prevent damages and disruptions to operations.

**END OF SECTION**

## SECTION 07 6200

### SHEET METAL FLASHING AND TRIM

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following sheet metal flashing and trim:
  - 1. Manufactured reglets.
  - 2. Formed roof drainage system.
  - 3. Formed low-slope roof flashing and trim.
  - 4. Formed wall flashing and trim.
  - 5. Formed equipment support flashing.
  - 6. Parapet scuppers
- B. Work of this section 07 6200 "Sheet Metal Flashing and Trim" by Division 7 Section 07 5419 "Polyvinyl Chloride (PVC) Roofing".
- C. Related Sections include the following:
  - 1. Section 04 2223 "Unit Masonry Assemblies" for installing through-wall flashing, reglets, and other sheet metal flashing and trim.
  - 2. Section 06 1053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
  - 3. Section 07 5420 "Polyvinyl-Chloride (PVC) Roofing" for installing sheet metal flashing and trim integral with roofing membrane.
  - 4. Section 07 7200 "Roof Accessories" for roof hatches, and other manufactured roof accessory units.
  - 5. Section 07 9200 "Joint Sealants" for field-applied sheet metal flashing and trim sealants.

##### 1.3 PERFORMANCE REQUIREMENTS

- A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. Wind Loading: Fabricate and install roof edge flashing and copings capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:
  - 1. Wind Zone 1: For velocity pressures of 21 to 30 lbf/sq. ft.: 60-lbf/sq. ft. perimeter uplift force, 90-lbf/sq. ft. corner uplift force, and 30-lbf/sq. ft. outward force.

- C. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.
- D. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

#### **1.4 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:
  - 1. Identify material, thickness, weight, and finish for each item and location in Project.
  - 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
  - 3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.
  - 4. Details of expansion-joint covers, including showing direction of expansion and contraction.
- C. Samples for Selection: For each type of sheet metal flashing and trim indicated with factory-applied color finishes.
  - 1. Include similar Samples of trim and accessories involving color selection.

#### **1.5 QUALITY ASSURANCE**

- A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

#### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.
- B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.



## 1.7 COORDINATION

- A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

## PART 2 - PRODUCTS

### 2.1 SHEET METALS

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653, G90 coating designation; structural quality, mill phosphatized for field painting.
- B. Pre-painted, Metallic-Coated Steel Sheet: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755.
  - 1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653, G90 coating designation; structural quality.
  - 2. Exposed Finishes: Apply the following coil coating:
    - a. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      - 1) Fluoropolymer Two-Coat System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat with color coat containing not less than 70 percent polyvinylidene fluoride resin by weight, complying with physical properties and coating performance requirements of AAMA 621, except as modified below
        - (a) Humidity Resistance: 2000 hours.
        - (b) Salt-Spray Resistance: 2000 hours.
      - 2) Color: As selected by Architect to match wall from manufacturer's full range including deep tone colors and metallics.
  - 3. Lead Sheet: ASTM B 749, Type L51121, copper-bearing lead sheet.
  - 4. Zinc Sheet: Electrolytic, 99 percent pure zinc alloyed with 1 percent titanium and copper.
    - a. Finish: Bright rolled.

### 2.3 UNDERLAYMENT MATERIALS

- A. Polyethylene Sheet: 6-mil- thick polyethylene sheet complying with ASTM D 4397.
- B. Slip Sheet: Rosin-sized paper, minimum 3 lb/100 sq. ft.

### 2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.
  - 1. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating.
  - 2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.
  - 3. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
  - 4. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
- C. Solder for Zinc: ASTM B 32, 60 percent lead and 40 percent tin with low antimony, as recommended by manufacturer.
- D. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
- E. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.
- G. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

## 2.5 MANUFACTURED SHEET METAL FLASHING AND TRIM

- A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory- mitered and -welded corners and junctions.
- B. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
  - 1. Manufacturers
    - a. Fry Reglet Corporation.
    - b. Cheney Flashing Company, Inc.; Type B Snap Lock.
- C. Properties:
  - 1. Material: Galvanized steel, 24 gauge.
  - 2. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
  - 3. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
  - 4. Flexible Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
  - 5. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

## 2.6 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.
- B. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
- C. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
  - 1. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.
- E. Seams: Comply with SMACNA "Architectural Sheet Metal Manual", (Sixth Edition, September 2003) Figure no. 3-2 and 3-3 as applicable to specific installations.
  - 1. Standing Seams: Provide double lock standing seams (detail no. 25, figure no. 3-3), with finish not less than 1-1/4 inches high.
- F. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.
- G. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.
- H. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
  - 1. Thickness: As recommended by SMACNA's "Architectural Sheet Metal Manual" for application but not less than thickness of metal being secured.

## 2.7 ROOF DRAINAGE SHEET METAL FABRICATIONS

- A. Parapet Scuppers: Fabricate scuppers of dimensions required with closure flange trim to exterior, 4-inch- wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper.
  - 1. Fabricate parapet scuppers from the following material:
    - a. Prepainted, Metallic-Coated Steel: 24 gauge (0.7 mm) thick.

## 2.8 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Copings: Fabricate in minimum 96-inch- long, but not exceeding 10-foot- long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, seal, and solder or weld watertight.
  - 1. Joint Style: Standing seams.
  - 2. Fabricate copings from 20 gauge prepainted, metallic-coated steel.
- B. Roof and Roof to Wall Transition Expansion-Joint Cover: 20 gauge prepainted, metallic-coated Steel.

- C. Base Flashing: 22 gauge galvanized steel.
- D. Counterflashing: 24 gauge galvanized steel
- E. Flashing Receivers: 24 gauge galvanized steel.
- F. Roof-Penetration Flashing: 22 gauge galvanized steel.
- G. Roof-Drain Flashing: Lead: 4.0 lb/sq. ft. (1.6 mm thick), hard tempered.

## **2.9 WALL SHEET METAL FABRICATIONS**

- A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- long, but not exceeding 12 foot long, sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings. Form with 2-inch- high end dams.
  - 1. Zinc: 15 gauge (0.040 inch) thick.
- B. Openings Flashing in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch- high end dams.
  - 1. 24 gauge prepainted, metallic-coated steel.
- C. Wall Expansion-Joint Cover:
  - 1. 22 gauge prepainted, metallic-coated Steel.

## **2.10 MISCELLANEOUS SHEET METAL FABRICATIONS**

- A. Equipment Support Flashing: 22 gauge galvanized steel.

## **2.11 FINISHES**

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.
  - 1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
  - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
1. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.
1. Coat side of sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
  2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene underlayment.
  3. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.
- C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
- D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric sealant.
- E. Install flashing and trim so that any edge that can be seen will not reveal the back side of the flashing.
- F. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
1. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
- G. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.
- H. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
1. Galvanized or Prepainted, Metallic-Coated Steel: Use stainless-steel fasteners.
- I. Seal joints with elastomeric sealant as required for watertight construction.
1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 degrees F, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 degrees F.
  2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

- J. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches except where pretinned surface would show in finished Work.
1. Do not solder prepainted, metallic-coated steel sheet.
  2. Pretinning is not required for lead.
  3. Where surfaces to be soldered are lead coated, do not tin edges, but wire brush lead coating before soldering.
  4. Do not use open-flame torches for soldering. Heat surfaces to receive solder and flow solder into joints. Fill joints completely. Completely remove flux and spatter from exposed surfaces.

### **3.3 ROOF DRAINAGE SYSTEM INSTALLATION**

- A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.
- B. Parapet Scuppers: Install scuppers where indicated through parapet. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
1. Anchor scupper closure trim flange to exterior wall and seal or solder to scupper.
  2. Conductor Heads: Anchor securely to wall with elevation of conductor head rim 1 inch below scupper or gutter discharge.
- C. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints a minimum of 4 inches in direction of water flow.
- D. Splash Pans: Install where downspouts discharge on low-sloped roofs. Set in elastomeric sealant compatible with roofing membrane.

### **3.4 ROOF FLASHING INSTALLATION**

- A. General: Install sheet metal roof flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated.
1. Interlock bottom edge of roof edge flashing with continuous cleats anchored to substrate at 16-inch centers.
- C. Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated.
1. Interlock exterior bottom edge of coping with continuous cleats anchored to substrate at 16-inch centers.
  2. Anchor interior leg of coping with screw fasteners and washers at 18-inch centers.
- D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

- E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant.
  - 1. Secure in a waterproof manner by means of snap-in installation and sealant.
- F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:
  - 1. Seal with elastomeric sealant and clamp flashing to pipes penetrating roof except for lead flashing on vent piping.

### **3.5 WALL FLASHING INSTALLATION**

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing: Installation of formed through-wall flashing is specified in Division 4 Section "Unit Masonry Assemblies."
- C. Reglets: Installation of reglets is specified in Division 3 Section "Cast-in-Place Concrete and in Division 4 Section "Unit Masonry Assemblies."
- D. Openings Flashing in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

### **3.6 MISCELLANEOUS FLASHING INSTALLATION**

- A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

### **3.7 CLEANING AND PROTECTION**

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

**END OF SECTION**

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## SECTION 07 7200

### ROOF ACCESSORIES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Roof hatches
- B. Related Sections include the following:
  - 1. Section 05 5000 "Metal Fabrications" for ladders and safety posts associated with roof hatches.
  - 2. Section 07 5419 "Polyvinyl-Chloride (PVC) Roofing" for roofing accessories.
  - 3. Section 07 6200 "Sheet Metal Flashing and Trim" for shop- and field-fabricated metal flashing and counterflashing, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.
  - 4. Section 11 3300 "Retractable Stairs" for stairs to be incorporated into roof hatches.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details for roof accessories. Show layouts of roof accessories including plans and elevations. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other work.
- C. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
  - 1. Size and location of roof accessories specified in this Section.
  - 2. Method of attaching roof accessories to roof or building structure.
  - 3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
- D. Warranty: Special warranty specified in this Section.

##### 1.4 QUALITY ASSURANCE

- A. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.

##### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Pack, handle, and ship roof accessories properly labeled in heavy-duty packaging to prevent damage.

## **1.6 PROJECT CONDITIONS**

- A. Field Measurements: Verify required openings for each type of roof accessory by field measurements before fabrication and indicate measurements on Shop Drawings.

## **1.7 COORDINATION**

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leak proof, weather tight, secure, and non-corrosive installation.

## **PART 2 - PRODUCTS**

### **2.1 METAL MATERIALS**

- A. Steel Shapes: ASTM A 36, hot-dip galvanized to comply with ASTM A 123, unless otherwise indicated.

### **2.2 MISCELLANEOUS MATERIALS**

- A. Glass-Fiber Board Insulation: ASTM C 726, 1 inch thick.
- B. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, complying with AWPA C2; not less than 1-1/2 inches thick.
- C. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- D. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by roof accessory manufacturer. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners.
- E. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.
- F. Elastomeric Sealant: ASTM C 920, polyurethane sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

## 2.3 ROOF HATCHES

- A. .Basis of Design: Contract Documents are based on product specified below to establish a standard of quality. Other available manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor, hatch is compatible with retractable ladder system, and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
- a. Manufacturer: Precision Ladders, LLC.
  - b. Product: PH - A (dimensions as required to accommodate retractable roof ladder).
- B. Available Manufacturers:
1. Babcock-Davis; a Cierra Products Inc. Company.
  2. Bilco Company (The).
  3. Dur-Red Products.
  4. Milcor Inc.; a Gibraltar Company.
  5. Precision Ladders, LLC.
  6. Wasco Products, Inc.
- C. Roof Hatches: Fabricate roof hatches with insulated double-wall lids and insulated double-wall curb frame with integral deck mounting flange and lid frame counterflashing. Fabricate with welded or mechanically fastened and sealed corner joints. Provide continuous weathertight perimeter gasketing and equip with corrosion-resistant or hot-dip galvanized hardware
1. Loads: Fabricate roof hatches to withstand 40-lbf/sq. ft. external and 20-lbf/sq. ft. internal loads.
  2. Type and Size: Single-leaf lid, 30 inches by 104 inches (minimum clear dimensions).
  3. Curb and Lid Material: Aluminum sheet, 0.090 inch (11 gage) thick.
    - a. Finish: Mill.
  4. Insulation: Glass-fiber board, 0.75 lb. density.
  5. Interior Lid Liner: Manufacturer's standard metal liner of same material and finish as outer metal lid.
  6. Exterior Curb Liner: Manufacturer's standard metal liner of same material and finish as metal curb.
  7. Fabricate units to minimum height of 12 inches, unless otherwise indicated.
  8. Sloping Roofs: Where slope or roof deck exceeds 1:48, fabricate hatch curbs with height tapered to match slope to level tops of units.
  9. Hardware: Galvanized steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside. Two point "slam lock".

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.
1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored and is ready to receive roof accessories.
  2. Verify dimensions of roof openings for roof accessories. Coordinate roof hatch with roof ladder dimensions and requirements.
  3. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. Install roof accessories to fit substrates and to result in watertight performance.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
  - 1. Coat concealed side of roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
  - 2. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for waterproof performance.
- D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
- E. Roof Hatch Installation:
  - 1. Check roof hatch for proper operation. Adjust operating mechanism as required. Clean and lubricate joints and hardware.
- F. Seal joints with elastomeric sealant as required by manufacturer of roof accessories.

### **3.3 TOUCH UP**

- A. Touch up factory-primed surfaces with compatible primer ready for field painting in accordance with Division 9 painting Sections.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

### **3.4 CLEANING**

- A. Clean exposed surfaces according to manufacturer's written instructions.

**END OF SECTION**

## SECTION 07 8400

### THROUGH-PENETRATION FIRESTOP SYSTEMS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes through-penetration firestop systems for penetrations through the following fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.
  - 1. Floors.
  - 2. Roofs.
  - 3. Walls and partitions.
  - 4. Smoke barriers.
  - 5. The work of this section shall include, but not be limited to:
    - a. All clips and other restraining devices necessary for holding fire protection material in place.
    - b. Other items necessary for a complete and integral installation thru out the entire perimeter and other penetrations.
- B. Related Sections include the following:
  - 1. Section 07 8400 "Through-Penetration Fire Stop Systems."
  - 2. Division 23 Sections specifying duct and piping penetrations.
  - 3. Division 26 Sections specifying cable and conduit penetrations.

##### 1.3 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through the following fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
  - 1. Fire-resistance-rated walls including fire walls, fire partitions, fire barriers, and smoke barriers.
  - 2. Fire-resistance-rated horizontal assemblies including floor/ceiling assemblies and ceiling membranes of roof/ceiling assemblies.
- B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814 or UL 1479:
  - 1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
  - 2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
    - a. Penetrations located outside wall cavities.
    - b. Penetrations located outside fire-resistance-rated shaft enclosures.
  - 3. L-Rated Systems: Where through-penetration firestop systems are indicated in

smoke barriers, provide through-penetration firestop systems with L-ratings of not more than 3.0 cfm/sq. ft at both ambient temperatures and 400 degrees F.

- C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
  - 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
  - 2. For floor penetrations with annular spaces exceeding 4 inches (100 mm) in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
  - 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

#### **1.4 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.
  - 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
- C. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:
  - 1. Types of penetrating items.
  - 2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
  - 3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.
- D. Qualification Data: For Installer.
- E. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

#### **1.5 QUALITY ASSURANCE**

- A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors."
- B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.
- C. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.

- D. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
  2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems complying with the following requirements:
    - a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
    - b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:
      - 1) UL in its "Fire Resistance Directory."
- E. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

## **1.7 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

## **1.8 COORDINATION**

- A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
- C. Notify Owner's inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.

- D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by Owner's inspecting agency and building inspector, if required by authorities having jurisdiction.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Available Products: Subject to compliance with requirements, through-penetration firestop systems that may be incorporated into the Work include, but are not limited to, those systems indicated that are produced by one of the following manufacturers:
  1. STI (Specified Technologies, Inc.).
  2. Hilti, Inc.
  3. Nelson Firestop Products.
  4. 3M; Fire Protection Products Division.
  5. Tremco; Sealant/Weatherproofing Division.

### **2.2 FIRESTOPPING, GENERAL**

- A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.
- C. Accessories include, but are not limited to, the following items:
  1. Permanent forming/damming/backing materials, including the following:
    - a. Slag/rock-wool-fiber insulation.
    - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
    - c. Fire-rated form board.
    - d. Fillers for sealants.
  2. Temporary forming materials.
  3. Substrate primers.
  4. Collars.
  5. Steel sleeves.

### **2.3 FILL MATERIALS**

- A. General: Provide through-penetration firestop systems containing the types of fill materials indicated. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.
- B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.



- C. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- E. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- F. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.
- G. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- H. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
  - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.

## **2.4 MIXING**

- A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:
  - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
  - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
  - 3. Remove laitance and form-release agents from concrete.

- B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

### **3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION**

- A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
  - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for firestop systems by proven techniques to produce the following results:
  - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
  - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
  - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

### **3.4 IDENTIFICATION**

- A. Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:
  - 1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
  - 2. Contractor's name, address, and phone number.
  - 3. Through-penetration firestop system designation of applicable testing and inspecting agency.
  - 4. Date of installation.
  - 5. Through-penetration firestop system manufacturer's name.
  - 6. Installer's name.

### **3.5 FIELD QUALITY CONTROL**

- A. Inspecting Agency: Owner will engage a qualified, independent inspecting agency to inspect through-penetration firestops. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.
- B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.
- C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

### **3.6 CLEANING AND PROTECTING**

- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

**END OF SECTION**

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## SECTION 07 9200

### JOINT SEALANTS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes sealants for the following applications, including those specified by reference to this Section:
  - 1. Exterior joints in the following vertical surfaces and non-traffic horizontal surfaces:
    - a. Control and expansion joints in cast-in-place concrete.
    - b. Control and expansion joints in unit masonry.
    - c. Joints in metal panel systems.
    - d. Joints between different materials listed above.
    - e. Perimeter joints between materials listed above and frames of doors and windows.
    - f. Control and expansion joints in ceiling and overhead surfaces.
    - g. Other joints as indicated.
  - 2. Exterior joints in the following horizontal traffic surfaces:
    - a. Control, expansion, and isolation joints in cast-in-place concrete slabs.
    - b. Tile control and expansion joints.
    - c. Joints between different materials listed above.
    - d. Other joints as indicated.
  - 3. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
    - a. Control and expansion joints on exposed interior surfaces of exterior walls
    - b. Perimeter joints of exterior openings where indicated.
    - c. Tile control and expansion joints.
    - d. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
    - e. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
    - f. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    - g. Joints between interior partitions and concrete floors.
    - h. Other joints as indicated.
  - 4. Interior joints in the following horizontal traffic surfaces:
    - a. Control and expansion joints in cast-in-place concrete slabs.
    - b. Control and expansion joints in tile flooring.
    - c. Other joints as indicated.
  - 5. All joints between dissimilar materials.
- B. Related Sections include the following:
  - 1. Section 04 2223 "Unit Masonry Assemblies" for masonry control and expansion joint fillers and gaskets.
  - 2. Section 07 8400 "Through-Penetration Firestop Systems" for fire-resistant building joint-sealant systems.
  - 3. Section 08 8000 "Glazing" for sealant applied in structural glazing systems.
  - 4. Section 09 2900 "Gypsum Board" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.

5. Section 09 5113 "Acoustical Panel Ceilings" for sealing edge moldings at perimeters of acoustical ceilings.

### **1.3 PERFORMANCE REQUIREMENTS**

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

### **1.4 SUBMITTALS**

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.

### **1.5 QUALITY ASSURANCE**

- A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Preconstruction Compatibility and Adhesion Testing: Submit to joint sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
  1. Use manufacturers standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
    - a. Perform tests under environmental conditions replicating those that will exist during installation.
  2. Submit not fewer than nine pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
  3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
  4. For materials failing tests, obtain joint sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
  5. Testing will not be required if joint sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

- D. Mockups: Before installing joint sealants, apply elastomeric sealants as follows to verify color selections and to demonstrate aesthetic effects and qualities of materials and execution:
1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.
  2. Provide not less than six and not more than twelve 12-inch long x typical width and depth samples of sealants and caulks for Owner and Architect review. Samples shall be installed at floors, walls, ceiling and other locations selected by Architect.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

## **1.7 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:
1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
  2. When joint substrates are wet.
- B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

## **1.8 WARRANTY**

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: Three years from date of Substantial Completion.
- B. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
  2. Disintegration of joint substrates from natural causes exceeding design specifications.
  3. Mechanical damage caused by individuals, tools, or other outside agents.
  4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS, GENERAL**

- A. Low-Emitting Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range for this characteristic.

### **2.2 ELASTOMERIC JOINT SEALANTS**

- A. Elastomeric Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant in the Elastomeric Joint-Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.
- B. Additional Movement Capability: Where additional movement capability is specified in the Elastomeric Joint-Sealant Schedule, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at the time of installation and remain in compliance with other requirements of ASTM C 920 for uses indicated.
- C. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

### **2.3 SOLVENT-RELEASE JOINT SEALANTS**

- A. Acrylic-Based Solvent-Release Joint-Sealant Standard: Comply with ASTM C 1311 for each product of this description indicated in the Solvent-Release Joint-Sealant Schedule at the end of Part 3.
- B. Butyl-Rubber-Based Solvent-Release Joint-Sealant Standard: Comply with ASTM C 1085 for each product of this description indicated in the Solvent-Release Joint-Sealant Schedule at the end of Part 3.

### **2.4 LATEX JOINT SEALANTS**

- A. Latex Sealant Standard: Comply with ASTM C 834 for each product of this description indicated in the Latex Joint-Sealant Schedule at the end of Part 3.



## **2.5 ACOUSTICAL JOINT SEALANTS**

- A. Acoustical Sealant for Exposed and Concealed Joints: For each product of this description indicated in the Acoustical Joint-Sealant Schedule at the end of Part 3, provide manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:
  - 1. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

## **2.6 JOINT-SEALANT BACKING**

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
- C. Type C: Closed-cell material with a surface skin.
- D. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 degrees F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
- E. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

## **2.7 MISCELLANEOUS MATERIALS**

- A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. All joints of dissimilar materials to receive joint sealant.

- B. Examine joints to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include concrete, masonry or unglazed surfaces of ceramic tile.
  - 3. Remove laitance and form-release agents from concrete.
  - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants to metal, glass, porcelain enamel or glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### **3.3 INSTALLATION OF JOINT SEALANTS**

- A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

- D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of sealant backings.
  - 2. Do not stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and back of joints.
- F. Install sealants by proven techniques to comply with the following and at the same time backings are installed:
  - 1. Place sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses provided for each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
  - 4. Seal abutting joint at all dissimilar materials.
- G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
  - 1. Remove excess sealants from surfaces adjacent to joint.
  - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  - 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
  - 4. Provide flush joint configuration, per Figure 5B in ASTM C 1193, where indicated.
  - 5. Provide recessed joint configuration, per Figure 5C in ASTM C 1193, of recess depth and at locations indicated.
    - a. Use masking tape to protect adjacent surfaces of recessed tooled joints.

### **3.4 CLEANING**

- A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

### **3.5 PROTECTION**

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

### 3.6 ELASTOMERIC JOINT-SEALANT SCHEDULE

- A. **Medium-Modulus Neutral-Curing Silicone Sealant:**
1. Available Products: Subject to compliance with requirements of Contract Documents, products which may be incorporated into the Work include, but are not limited to, the following:
    - a. 791; Dow Corning.
    - b. PSI-631; Polymeric Systems, Inc.
    - c. MasterSeal NP 150, Sika.
    - d. Spectrem 2; Tremco.
  2. Type and Grade: S (single component) and NS (nonsag).
  3. Class: 25.
  4. Use Related to Exposure: NT (nontraffic).
  5. Uses Related to Joint Substrates: M (masonry), G (glass), A (aluminum), and, as applicable to joint substrates indicated, O (other).
    - a. Use O Joint Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick and masonry, ceramic tile, and wood.
  6. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.
  7. Applications: Exterior and interior joints in vertical surfaces of concrete; between metal and concrete and mortar; perimeter of metal frames in exterior walls; overhead or ceiling joints.
- B. **Mildew-Resistant Silicone Sealant:**
1. Available Products: Subject to compliance with requirements of Contract Documents, products which may be incorporated into the Work include, but are not limited to, the following:
    - a. 786 Mildew Resistant; Dow Corning.
    - b. Sanitary 1700; GE Silicones.
    - c. Tremsil 600 White; Tremco.
    - d. MasterSeal NP 150, Sika.
  2. Type and Grade: S (single component) and NS (nonsag); formulated with fungicide.
  3. Class: 25.
  4. Use Related to Exposure: NT (nontraffic); intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes.
  5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.
    - a. Use O Joint Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, and ceramic tile.
  6. Applications: Interior joints in vertical surfaces of ceramic tile in toilet rooms, and showers.
- C. **Multicomponent Pourable Urethane Sealant:**
1. Available Products: Subject to compliance with requirements of Contract Documents, products which may be incorporated into the Work include, but are not limited to, the following:
    - a. Vulkem 245; Mameco International.
    - b. Elasto-Thane 920 Pourable; Pacific Polymers, Inc.
    - c. Sikaflex - 2c SL; Sika Corporation.
    - d. MasterSeal SL 2; SikaF.

2. Type and Grade: M (multicomponent) and P (pourable).
  3. Class: 25.
  4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
  5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.
    - a. Use O Joint Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick and masonry, ceramic tile, and wood.
  6. Applications: Traffic joints.
- D. Single-Component Nonsag Urethane Sealant:
1. Available Products: Subject to compliance with requirements of Contract Documents, products which may be incorporated into the Work include, but are not limited to, the following:
    - a. Vulkem 921; Mameco International.
    - b. Dynatrol I; Pecora Corporation.
    - c. DyMonic; Tremco.
    - d. MasterSeal NP1, Sika
  2. Type and Grade: S (single component) and NS (nonsag).
  3. Class: 25
  4. Use Related to Exposure: NT (nontraffic).
  5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.
    - a. Use O Joint Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick and masonry, ceramic tile, and wood.
  6. Applications: Joints in concrete.

### 3.7 LATEX JOINT-SEALANT SCHEDULE

- A. Latex Sealant:
1. Available Products: Subject to compliance with requirements of Contract Documents, products which may be incorporated into the Work include, but are not limited to, the following:
    - a. AC-20; Pecora Corporation.
    - b. Tremflex 834; Tremco.
  2. Applications: Interior joints in field-painted vertical and overhead surfaces at hollow metal door frames, gypsum drywall, and concrete; and all other interior locations not indicated otherwise.

### 3.8 ACOUSTICAL JOINT-SEALANT SCHEDULE

- A. Acoustical Sealant for Exposed and Concealed Joints:
1. Available Products: Subject to compliance with requirements of Contract Documents, products which may be incorporated into the Work include, but are not limited to, the following:
    - a. AC-20 FTR Acoustical and Insulation Sealant; Pecora Corporation.
    - b. SHEETROCK Acoustical Sealant; USG Corp., United States Gypsum Co.
    - c. SpecSeal® Smoke 'N' Sound Acoustical Sealant; STI.
  2. Applications: Use in locations of sound walls and in locations indicated.

**END OF SECTION**

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## **DIVISION 08 – OPENINGS**

|                    |                                     |
|--------------------|-------------------------------------|
| Section 08 1113    | Hollow Metal Doors and Frames       |
| Section 08 1416    | Flush Wood Doors                    |
| Section 08 3113    | Access Doors and Frames             |
| Section 08 3326    | Overhead Coiling Grilles            |
| Section 08 3613    | Sectional Overhead Doors            |
| Section 08 4113    | Aluminum Entrances and Storefronts  |
| Section 08 4329    | Sliding Aluminum-Framed Glass Doors |
| Section 08 6200    | Unit Skylights                      |
| Section 08 7100    | Door Hardware                       |
| Section 08 8000    | Glazing                             |
| Section 08 8300    | Mirrored Glass                      |
| Section 08 8723.16 | Security Films                      |
| Section 08 8800    | Decorative Glass                    |

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## SECTION 08 1113

### HOLLOW METAL DOORS AND FRAMES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. Section Includes:
  - 1. Steel doors.
  - 2. Hollow metal door frames.
  - 3. Hollow metal window frames
  - 4. Fire rated doors and frame assemblies.
  
- B. Related Sections
  - 1. Section 04 2223 "Unit Masonry Assemblies" for embedding anchors for hollow metal work into masonry construction.
  - 2. Section 08 1416 "Flush Wood Doors" for wood doors installed in steel frames.
  - 3. Section 08 7100 "Door Hardware" for door hardware for hollow metal doors.
  - 4. Section 08 8000 "Glazing" for glass in glazed openings.
  - 5. Section 09 2900 "Gypsum Board" for spot grouting frames installed in steel framed gypsum board partitions
  - 6. Sections 09 9100 "Painting" for field painting hollow metal doors and frames.
  - 7. Division 26 Sections for electrical connections including conduit and wiring for door controls and operators.

##### 1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.
  
- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

##### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, temperature-rise ratings, and finishes.
  
- B. Shop Drawings: Include the following:
  - 1. Elevations of each door and window frame design.
  - 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
  - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
  - 4. Locations of reinforcement and preparations for hardware.
  - 5. Details of each different wall opening condition.
  - 6. Details of anchorages, joints, field splices, and connections.
  - 7. Details of accessories.
  - 8. Details of moldings, removable stops, and glazing.

- C. Other Action Submittals:
  - 1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.
- D. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

## **1.5 QUALITY ASSURANCE**

- A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.
- B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252.
  - 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
  - 2. Temperature-Rise Limit: Where indicated, but not limited to, vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 degrees F above ambient after 30 minutes of standard fire-test exposure.
- C. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
  - 1. Provide additional protection to prevent damage to finish of factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Do not store in a manner that traps excess humidity.
  - 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

## **1.7 PROJECT CONDITIONS**

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

## 1.8 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements of Contract Documents, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  1. Ceco Door Products; an Assa Abloy Group company.
  2. Curries Company; an Assa Abloy Group company.
  3. Pioneer Industries, Inc.
  4. Steelcraft; an Allegion company.
  5. Republic Doors; an Allegion company.
  6. Security Metal Products Corp.

### 2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Hot-Rolled Steel Sheet: ASTM A 1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- D. Metallic-Coated Steel Sheet: ASTM A 653, Commercial Steel (CS), Type B; with minimum A40 metallic coating.
- E. Frame Anchors: ASTM A 591, Commercial Steel (CS), 40Z coating designation; mill phosphatized.
  1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008 or ASTM A 1011, hot-dip galvanized according to ASTM A 153, Class B.
- F. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153.
- G. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.
- H. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143.
- I. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- J. Glazing: Comply with requirements in Division 8 Section "Glazing."

- K. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

### 2.3 STANDARD HOLLOW METAL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
1. Design: Flush panel.
  2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.
    - a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
    - b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 2.5 degrees F x h x sq. ft./Btu when tested according to ASTM C 1363.
      - 1) Locations: Exterior doors and interior doors where indicated.
  3. Vertical Edges for Single-Acting Doors: Beveled edge.
    - a. Beveled Edge: 1/8 inch in 2 inches.
  4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- thick, end closures or channels of same material as face sheets.
  5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
1. Level 4 and Physical Performance Level A (Maximum Duty), Model 2 (Seamless) (14 gauge face).
- C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
1. Level 2 and Physical Performance Level A (Heavy Duty), Model 2 (Seamless) (18 gauge face).
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

### 2.4 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated from metallic-coated steel sheet.
1. Fabricate frames with mitered or coped corners.
  2. Fabricate frames as face welded unless otherwise indicated.
  3. Frames for Level 4 Steel Doors: 14 gauge (0.067-inch) thick steel sheet.

- C. Interior Frames: Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated.
  - 1. Fabricate frames with mitered or coped corners.
  - 2. Fabricate frames as face welded unless otherwise indicated.
  - 3. Frames for Level 2 Steel Doors: 16 gauge (0.053-inch) thick steel sheet.
  - 4. Frames for Wood Doors: 16 gauge (0.053-inch) thick steel sheet.
  - 5. Frames for Borrowed Lights: 16 gauge (0.053-inch) thick steel sheet.
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

## **2.5 FRAME ANCHORS**

- A. Jamb Anchors:
  - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 19 gauge (0.042 inch) thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 26 gauge (0.177 inch) thick.
  - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 19 gauge (0.042 inch) thick.
  - 3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, not less than 19 gauge (0.042 inch) thick, and as follows:
  - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

## **2.6 STOPS AND MOLDINGS**

- A. Moldings for Glazed Lites in Doors: Minimum 21 gauge (0.032 inch) thick, fabricated from same material as door face sheet in which they are installed.
- B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.
- C. Loose Stops for Glazed Lites in Frames: Minimum 21 gauge (0.032 inch) thick, fabricated from same material as frames in which they are installed.

## **2.7 ACCESSORIES**

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch- wide steel.
- C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

## 2.8 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.
- C. Hollow Metal Doors:
1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
  2. Glazed Lites: Factory cut openings in doors.
  3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
- D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
  2. Sidelight Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
  3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
  4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
  5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
  6. Jamb Anchors: Provide number and spacing of anchors as follows:
    - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      - 1) Two anchors per jamb up to 60 inches high.
      - 2) Three anchors per jamb from 60 to 90 inches high.
      - 3) Four anchors per jamb from 90 to 120 inches high.
      - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
    - b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      - 1) Three anchors per jamb up to 60 inches high.
      - 2) Four anchors per jamb from 60 to 90 inches high.
      - 3) Five anchors per jamb from 90 to 96 inches high.
      - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
      - 5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.
    - c. Compression Type: Not less than two anchors in each jamb.
    - d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
  - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
  - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
  
- E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
  
- F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware."
  1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
  2. Reinforce doors and frames to receive non-templated, mortised and surface-mounted door hardware.
  3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
  4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.
  5. Provide auxiliary hinge reinforcement at all hinge locations on every frame.
  
- G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
  1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
  2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
  3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
  4. Provide loose stops and moldings on inside of hollow metal work.
  5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

## **2.9 STEEL FINISHES**

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
  1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
  - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
  - 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
  - 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
  - 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

### 3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
  - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
    - a. At fire-protection-rated openings, install frames according to NFPA 80.
    - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    - c. Install frames with removable glazing stops located on secure side of opening.
    - d. Install door silencers in frames before grouting.
    - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    - f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    - g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.
  - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
    - a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
  - 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.



4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
  5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
  6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
  7. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
  8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
  9. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
    - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Standard Steel Doors:
    - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
    - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
    - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
    - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
  2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Glazing: Comply with installation requirements in Division 8 Section "Glazing" and with hollow metal manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

### **3.4 ADJUSTING AND CLEANING**

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

**END OF SECTION**

**SECTION 08 1416**  
**FLUSH WOOD DOORS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Solid-core doors with wood-veneer faces.
  - 2. Factory finishing flush wood doors.
  - 3. Fire rated wood doors.
- B. Related Sections include the following:
  - 1. Section 08 8000 "Glazing" for glass view panels in flush wood doors.

**1.3 SUBMITTALS**

- A. Product Data: For each type of door. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data:
  - 1. Dimensions and locations of mortises and holes for hardware.
  - 2. Dimensions and locations of cutouts.
  - 3. Undercuts.
  - 4. Requirements for veneer matching.
  - 5. Doors to be factory finished and finish requirements.
  - 6. Fire ratings for fire doors.
- C. Samples for Selection: Color charts consisting of actual materials in small sections for the following:
  - 1. Faces of Factory-Finished Doors: Show the full range of colors available for stained finishes.

**1.4 QUALITY ASSURANCE**

- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.
- B. Quality Standard: Comply with AWI/AWMAC/WI "Architectural Woodwork Standards."
  - 1. Provide AWS Quality Certification Labels or an AWS letter of licensing for Project indicating that doors comply with requirements of grades specified.

- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
  - 1. Test Pressure: Test at atmospheric pressure.
  - 2. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating of 450 degrees F maximum in 30 minutes of fire exposure.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

## 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

## 1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
  - 1. Warranty shall be in effect during the following period of time from date of Substantial Completion:
    - a. Solid-Core Interior Doors: Life of installation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Eggers Industries; Architectural Door Division.
  - 2. Assa Abloy; Graham/Maiman.
  - 3. Oshkosh Door Company.
  - 4. VT Industries Inc.
  - 5. Masonite Architectural; Marshfield-Algoma.

### 2.2 DOOR CONSTRUCTION, GENERAL

- A. **Doors for Transparent Finish:**
  - 1. Grade: Premium, with Grade A faces.
  - 2. Species and Cut: Select clear cherry, all heartwood, plain sliced.

3. Match between Veneer Leaves: Book match.
4. Assembly of Veneer Leaves on Door Faces: Running match.
5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
6. Stiles: Same species as faces.

## 2.3 SOLID-CORE DOORS

- A. Particleboard Cores: Comply with the following requirements:
  1. Particleboard: ANSI A208.1, Grade LD-2.
- B. Interior Veneer-Faced Doors:
  1. Core: Particleboard.
  2. Construction: Five plies with stiles and rails bonded to core; entire unit abrasive planed before veneering.
- C. Fire-Rated Doors:
  1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as needed to provide fire rating indicated. Comply with NFPA 80 for fire-rated doors
  2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated as follows:
    - a. 5-inch top-rail blocking.
    - b. 5-inch bottom-rail blocking, in doors indicated to have protection plates.
    - c. 5-inch midrail blocking, in doors indicated to have armor plates.
    - d. 5-inch midrail blocking, in doors indicated to have exit devices.
  3. Edge Construction: At hinge stiles, provide manufacturer's standard laminated-edge construction with improved screw-holding capability and split resistance and with outer stile matching face veneer.
  4. Pairs: Provide fire-rated pairs with fire-retardant stiles matching face veneer that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals.

## 2.4 LIGHT FRAMES

- A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.
  1. Wood Species: Same species as door faces.
  2. Profile: Flush rectangular beads
- B. Metal Frames for Light Openings at Rated Doors: Manufacturer's standard frame formed of 18 gauge, cold-rolled steel sheet, factory primed.
  1. Metal frames for light openings shall match fire rating indicated for doors.

## 2.5 FABRICATION

- A. Fabricate doors in sizes indicated for Project-site fitting.
  1. Comply with clearance requirements of referenced quality standard for fitting.
- B. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
  1. Light Openings: Trim openings with moldings of material and profile indicated.

## 2.6 FACTORY FINISHING

- A. General: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated" for factory finishing.
- B. Finish doors at factory.
- C. Transparent Finish:
  - 1. Grade: Premium.
  - 2. Finish: Water-based stain with Marshfield "EnviroClad UV" or equivalent as judged by Architect; meet or exceed AWS System 9 - UV cured polyurethane.
  - 3. Staining: Refer to Finish Schedule.
  - 4. Effect: Open-grain finish.
  - 5. Sheen: Semigloss.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
  - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
  - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Hardware: For installation, see Division 8 Section "Door Hardware."
- B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
  - 1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold.
    - a. Comply with NFPA 80 for fire-rated doors.
  - 2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
  - 3. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

### **3.3 ADJUSTING**

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

**END OF SECTION**

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## SECTION 08 3113

### ACCESS DOORS AND FRAMES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Wall access doors and frames.
  - 2. Ceiling access doors and frames.
- B. Related Sections include the following:
  - 1. Section 04 2223 "Unit Masonry Assemblies" for anchoring and grouting access door frames set in masonry construction.
  - 2. Section 07 7200 "Roof Accessories" for roof hatches.
  - 3. Section 08 7100 "Door Hardware" for mortise or rim cylinder locks and master keying.
  - 4. Section 22 1413 "Facility Storm Drainage Piping" for connection of floor door drainage couplings to drains.
  - 5. Section 23 3300 "Air Duct Accessories" for heating and air-conditioning duct access doors..

##### 1.3 SUBMITTALS

- A. Product Data: For each type of door and frame indicated. Include construction details relative to materials, individual components and profiles, finishes, and fire ratings (if required) for access doors and frames.
- B. Shop Drawings: Show fabrication and installation details of customized doors and frames. Include plans, elevations, sections, details, and attachments to other Work.
- C. Schedule: Provide complete door and frame schedule, including types, general locations, sizes, construction details, latching or locking provisions, and other data pertinent to installation.
- D. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items with concealed framing, suspension systems, piping, ductwork, and other construction. Show the following:
  - 1. Method of attaching door frames to surrounding construction.
  - 2. Ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim.

##### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain doors and frames through one source from a single manufacturer.
- B. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

## **1.5 COORDINATION**

- A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed equipment, and indicate on schedule specified in "Submittals" Article.

## **1.6 ALLOWANCES**

- A. Beyond the access doors indicated on the Drawings that are called out with sizes and locations, include five (5) 24 inch square flush panel access doors and five (5) 24 inch square flush one hour fire rated panel access doors to be located as directed by the Architect. Cost to include installation and General Contractor's mark up. The doors may be located in gypsum board or masonry walls, in order to determine the cost of the allowance provide which ever type of door is more expensive. If all of the doors in the allowance are not used, provide a credit to the Owner.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  1. J. L. Industries, Inc, a part of Activar Construction Products Group.
  2. Larsen's Manufacturing Company, a member of Morris Group International.
  3. Hart & Cooley/Milcor, a trademark of Johnson Controls, Inc.
  4. Maxam Metal Products

### **2.2 MATERIALS**

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, Commercial Steel (CS), with Class C coating and phosphate treatment to prepare surface for painting; with minimum thickness indicated representing specified nominal thickness according to ASTM A 568/A 568M for uncoated base metal.
- C. Drywall Beads: Edge trim formed from 22 gauge zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

### **2.3 PAINT**

- A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

## 2.4 ACCESS DOORS AND FRAMES

- A. Flush, Insulated, Fire-Rated Access Doors and Trimless Frames: Fabricated from steel sheet.
1. Locations: Gypsum board wall and ceiling surfaces. Fire resistance rating to be 1 hour minimum rating or as scheduled on Drawings.
  2. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 20 gauge.
  3. Frame: Minimum 16 gauge sheet metal with drywall bead.
  4. Hinges: Continuous piano hinge.
  5. Automatic Closer: Spring type.
  6. Latch: Self-latching bolt operated by knurled knob with interior release.
  7. Lock: Key-operated cylinder lock with interior release.
  8. Size: As indicated on the Drawings, or for determining the allowance provide 24 inches square.
- B. Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.
1. Locations: Masonry, concrete and ceramic-tile wall surfaces.
  2. Door: Minimum 16 gauge sheet metal, set flush with exposed face flange of frame.
  3. Frame: Minimum 16 gauge sheet metal with 1-inch wide, surface-mounted trim.
  4. Hinges: Continuous piano hinge.
  5. Latch: Screwdriver-operated cam latch.
  6. Lock: Key-operated cylinder lock.
  7. Size: As indicated on the Drawings, or for determining the allowance provide 24 inches square.
- C. Flush Access Doors and Trimless Frames: Fabricated from steel sheet.
1. Locations: Gypsum board wall and ceiling surfaces.
  2. Door: Minimum 16 gauge sheet metal, set flush with surrounding finish surfaces.
  3. Frame: Minimum 16 gauge sheet metal with drywall bead.
  4. Hinges: Continuous piano hinge.
  5. Latch: Screwdriver-operated cam latch.
  6. Lock: Key-operated cylinder lock.
  7. Size: As indicated on the Drawings, or for determining the allowance provide 24 inches square.

## 2.5 FABRICATION

- A. General: Provide access door assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Steel Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
1. Exposed Flanges: Nominal 1 to 1-1/2 inches wide around perimeter of frame.
  2. For trimless frames with drywall bead for installation in gypsum board assembly, provide edge trim for gypsum board securely attached to perimeter of frames.
  3. Provide mounting holes in frames to attach frames to framing in drywall construction and to attach masonry anchors in masonry construction. Furnish adjustable metal masonry anchors.

- D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
  - 1. For cylinder lock, furnish two keys per lock and key all locks alike.

## **2.6 FINISHES, GENERAL**

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

## **2.7 METALLIC-COATED STEEL FINISHES**

- A. Galvanizing of Steel Shapes and Plates: Hot-dip galvanize items indicated to comply with applicable standard listed below:
  - 1. ASTM A 153, for galvanizing steel and iron hardware.
- B. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. For galvanized surfaces, apply, after cleaning, a conversion coating suited to the organic coating to be applied over it. For metallic-coated surfaces, clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
  - 1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- C. Factory Priming for Field-Painted Finish: Apply shop primer immediately after cleaning and pretreating.

## **2.8 STEEL FINISHES**

- A. Surface Preparation: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:
  - 1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- B. Apply shop primer to uncoated surfaces of metal fabrications. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Advise installers of other work about specific requirements relating to access door and floor door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices.

### **3.2 INSTALLATION**

- A. Comply with manufacturer's written instructions for installing access doors and frames and floor doors and frames.
- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

- C. Install access doors with trimless frames and floor doors flush with adjacent finish surfaces or recessed to receive finish material.

### **3.3 ADJUSTING AND CLEANING**

- A. Adjust doors and hardware after installation for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

**END OF SECTION**

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## SECTION 08 3326

### OVERHEAD COILING GRILLES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Electric-motor-operated overhead coiling grilles.
- B. Related Sections include the following:
  - 1. Section 05 5000 "Metal Fabrications" for miscellaneous steel supports.
  - 2. Section 07 9200 "Joint Sealants" for weatherproof joints at hoods.
  - 3. Section 08 7100 "Door Hardware" for lock cylinders and keying.
  - 4. Division 26 Sections for electrical service and connections for powered operators, and accessories.

##### 1.3 DEFINITIONS

- A. Operation Cycle: One cycle of a door is complete when it is moved from the closed position to the fully open position and returned to the closed position.

##### 1.4 PERFORMANCE REQUIREMENTS

- A. Operation-Cycle Requirements: Provide overhead coiling grille components and operators capable of operating for not less than 50,000 cycles and for 10 cycles per day.

##### 1.5 SUBMITTALS

- A. Product Data: For each type and size of overhead coiling grille and accessory.
  - 1. Summary of forces and loads on walls and jambs.
- B. Shop Drawings: For special components and installations not dimensioned or detailed in manufacturer's product data.
- C. Samples for Selection: Manufacturer's color charts showing full range of colors available for units with factory applied finishes.

##### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain overhead coiling grilles through one source from a single manufacturer.
  - 1. Obtain operators and controls from overhead coiling grille manufacturer.

- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  1. Alumatec Pacific Products.
  2. Cornell Cookson Company.
  3. McKeon Rolling Steel Door Company, Inc.
  4. Overhead Door Corp.

### **2.2 GRILLE CURTAIN MATERIALS AND CONSTRUCTION**

- A. General: Fabricate overhead coiling grille curtain consisting of a network of 5/16-inch-minimum diameter horizontal rods, or rods covered with tube spacers, spaced as indicated. Interconnect rods by vertical links approximately 5/8 inch wide, spaced as indicated and rotating on rods.
  1. Space rods at approximately 2 inches o.c.
  2. Space links approximately 9 inches apart in a straight in-line pattern.
  3. Aluminum Grille Curtain: ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- B. Endlocks: Continuous end links, chains, or other devices at ends of rods; locking and retaining grille curtain in guides against excessive pressures, maintaining grille curtain alignment, and preventing lateral movement.
- C. Bottom Bar: Manufacturer's standard continuous channel, tubular shape, or two angles, finished to match grille.
  1. Astragal: Provide a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene; for placement between angles or fitted to shape, as a cushion bumper for grille.
  2. Provide motor-operated grilles with combination bottom astragal and sensor edge.
- D. Grille Curtain Jamb Guides: Manufacturer's standard extruded-aluminum shape having curtain groove with return lips or bars to retain curtain. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise; with removable stops on guides to prevent overtravel of curtain.

### **2.3 HOOD AND ACCESSORIES**

- A. Hood: Form to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods, and provide fascia for any portion of between-jamb mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sagging.
  1. Fabricate hoods for aluminum grilles of minimum 0.032-inch-thick aluminum, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, complying with ASTM B 209.
  2. Provide removable metal soffit of same material and finish as curtain if hood is mounted above ceiling, unless otherwise indicated.



- B. Push/Pull Handles: For push-up-operated or emergency-operated grilles, provide manufacturer's standard lifting handles on each side of grille.
  - 1. Provide pull-down straps or pole hooks for grilles more than 84 inches high.
  - 2. Provide chain for raising and lowering grille in case of power loss. Chain shall be concealed above ceiling when not in use
- C. Locking Device: Fabricate locking device assembly with lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bar to engage through slots in tracks.
  - 1. Locking Bars: Single-jamb side, operable from inside only.
  - 2. Lock cylinder is specified in Division 8 Section "Door Hardware."
- D. Power Lockout: If grille curtain is power operated, provide safety interlock switch to disengage power supply when grille is locked.
- E. Mounting Tube Frame: Provide manufacturer's standard mounting tube frame designed to support grille; factory fabricated from structural-steel tubes; fastened to floor and structure above grille; to be built into wall construction; and complete with anchors, connections, and fasteners.

## **2.4 COUNTERBALANCING MECHANISM**

- A. General: Counterbalance grille curtain by means of adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to grille curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up grille curtain without distortion of curtain and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.
- C. Springs: Provide spring balance of one or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of grille curtain, with uniform adjustment accessible from outside barrel. Provide cast-steel barrel plugs to secure ends of springs to barrel and shaft.
- D. Torsion rod: Fabricate torsion rod for counterbalance shaft of cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Provide mounting brackets of manufacturer's standard design, either cast iron or cold-rolled steel plate.

## **2.5 ELECTRIC GRILLE OPERATORS**

- A. General: Provide electric grille operator assembly of size and capacity recommended and provided by grille manufacturer for grille specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking grille, and accessories required for proper operation.
- B. Standards: Comply with NFPA 70.

- C. Disconnect Device: Provide hand-operated disconnect or mechanism for automatically engaging chain and sprocket operator and releasing brake for emergency manual operation while disconnecting motor, without affecting timing of limit switch. Mount disconnect and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- D. Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.
- E. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V, ac or dc.
- F. Grille-Operator Type: Provide wall-, hood-, or bracket-mounted, jackshaft, gear-head-type grille operator unit consisting of electric motor, enclosed worm-gear running-in-oil primary drive, and chain and sprocket secondary drive; with quick disconnect-release for manual operation.
- G. Electric Motors: Provide high-starting torque, reversible, continuous-duty, Class A insulated, electric motors complying with NEMA MG 1; with overload protection; sized to start, accelerate, and operate grille in either direction from any position, at not less than 2/3 fps and not more than 1 fps, without exceeding nameplate ratings or service factor.
  - 1. Type: Medium-induction type.
  - 2. Service Factor: According to NEMA MG 1, unless otherwise indicated.
  - 3. Coordinate wiring requirements and electric characteristics of motors with building electrical system.
  - 4. Provide open drip-proof-type motor, and controller with NEMA ICS 6, Type 1 enclosure.
- H. Remote-Control Station: Provide sustained-pressure tamperproof key switches with three-position control station and positions labeled "Open," "Close," and "Stop."
  - 1. Provide interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
    - a. Limit Switches: Provide adjustable switches, interlocked with motor controls and set to automatically stop grille at fully opened and fully closed positions.
- I. Obstruction Detection Device: Provide each motorized grille with indicated external automatic safety sensor capable of protecting full width of grille opening. Activation of sensor immediately stops and reverses downward grille travel. Select one of two sensor types below.
  - 1. Sensor Edge: Provide each motorized grille with an automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor immediately stops and reverses downward grille travel. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
    - a. Provide electrically actuated automatic bottom bar.
- J. Limit Switches: Provide adjustable switches, interlocked with motor controls and set to automatically stop grille at fully opened and fully closed positions
- K. ADA-Compliant: Provide electric operators with ADA-compliant audible alarm and visual indicator lights.

## **2.6 FINISHES, GENERAL**

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## **2.7 ALUMINUM FINISHES**

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes. Class II, Clear Anodic Finish:  
AA-M12C22A31

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. General: Install grilles and operating equipment, complete with necessary hardware, according to Shop Drawings, manufacturer's written instructions, and as specified.

### **3.2 ADJUSTING**

- A. Lubricate bearings and sliding parts; adjust grilles to operate easily, free of warp, twist, or distortion and with tight fit around entire perimeter.

### **3.3 STARTUP SERVICES**

- A. Engage a factory-authorized service representative to perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

### **3.4 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling grilles. Refer to Division 1 Section "Closeout Procedures."

**END OF SECTION**

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## SECTION 08 3613

### SECTIONAL OVERHEAD DOORS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following types of sectional overhead doors:
  - 1. Insulated steel doors
  - 2. Tracks configured as shown on Drawings.
- B. Related Sections include the following:
  - 1. Section 08 7100 "Door Hardware" for lock cylinders and keying.
  - 2. Section 26 0120 "Conductors and Cables" for electrical service and connections for powered operators, and accessories.
  - 3. Section 26 0170 "Disconnect Switches" for disconnect switches for powered operators.

##### 1.3 DEFINITIONS

- A. Operation Cycle: One complete cycle of a door begins with the door in the closed position, moved to the open position and back to the closed position.

##### 1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide sectional overhead doors capable of withstanding the effects of gravity loads and the following loads and stresses without evidencing permanent deformation of door components:
  - 1. Wind Load: Uniform pressure (velocity pressure) of 20 lbf/sq. ft., acting inward and outward.
- B. Operation-Cycle Requirements: Design sectional overhead door components and operator to operate for not less than 50,000 cycles.

##### 1.5 SUBMITTALS

- A. Product Data: For each type and size of sectional overhead door and accessory. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes. Provide roughing-in diagrams, operating instructions, and maintenance information. Include the following:
  - 1. Setting drawings, templates, and installation instructions for built-in or embedded anchor devices.
  - 2. Summary of forces and loads on walls and jambs.
  - 3. Motors: Show nameplate data and ratings; characteristics; mounting arrangements; size and location of winding termination lugs, conduit entry, and grounding lug; and coatings.

- B. Shop Drawings: For special components and installations not dimensioned or detailed in manufacturer's data sheets.
  - 1. Furnish custom details demonstrating conformance to conditions indicated on Drawings.
  - 2. Wiring Diagrams: Detail wiring for power, signal, and control systems. Differentiate between manufacturer-installed and field-installed wiring and between components provided by door manufacturer and those provided by others.
- C. Samples for Selection: Manufacturer's color charts showing the full range of colors available for units with factory-applied finishes.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who is an authorized representative of the sectional overhead door manufacturer for both installation and maintenance of units required for this Project.
- B. Manufacturer Qualifications: Engage a firm experienced in manufacturing sectional overhead doors similar to those indicated for this Project and with a record of successful in-service performance.
- C. Source Limitations: Obtain sectional overhead doors through one source from a single manufacturer.
  - 1. Obtain operators and controls from the sectional overhead door manufacturer.
- D. Product Options: Drawings indicate size, profiles, and dimensional requirements of sectional overhead doors and accessories and are based on the specific system indicated. Other manufacturers' systems with equal performance and dimensional characteristics may be considered. Refer to Division 1 Section "Substitutions."
- E. Listing and Labeling: Provide electrically operated fixtures specified in this Section that are listed and labeled.
  - 1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
  - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. **Basis of Design:** Contract Documents are based on products specified below to establish a standard of quality. Other available manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
  - 1. Manufacturer: Overhead Door Corporation.
  - 2. Product: Exterior Insulated Steel Doors: Series 432.

- B. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Clopay Building Products Co.
  2. General American Door Co.
  3. McKee Door, Inc.; a United Dominion Company.
  4. Overhead Door Corporation.
  5. Raynor Garage Doors.
  6. Wayne-Dalton Corp.

## 2.2 STEEL SECTIONS

- A. Door Assembly: Insulated steel door assembly with rabbeted meeting rails to form weathertight joints and provide full-width interlocking structural rigidity.
1. Panel Thickness: 2 inches.
  2. Exterior Surface: Ribbed.
  3. Exterior Steel: Nominal 24 gauge, hot-dip galvanized.
  4. Back Cover: 26 gauge steel.
  5. Glazing: Fully glazed aluminum sash panels with insulated double strength glass.
- B. Insulation: Polystyrene - R-value of 7.35; U-value of 0.136.
- C. Finish and Color: Two coat baked-on polyester or epoxy; custom colors as selected by Architect.
- D. Operation: Motorized.

## 2.3 TRACKS, SUPPORTS, AND ACCESSORIES

- A. Tracks: Provide manufacturer's standard, galvanized steel track system, sized for door size and weight, designed for lift type indicated and clearances shown, and complying with ASTM A 653, for minimum G60 zinc coating. Provide complete track assembly including brackets, bracing, and reinforcement for rigid support of ball-bearing roller guides for required door type and size. Slot vertical sections of track at 2 inches on center for door-drop safety device. Slope tracks at proper angle from vertical or otherwise design to ensure tight closure at jambs when door unit is closed. Weld or bolt to track supports.
- B. Track Reinforcement and Supports: Provide galvanized steel track reinforcement and support members, complying with ASTM A 36 and ASTM A 123. Secure, reinforce, and support tracks as required for door size and weight to provide strength and rigidity without sag, sway, and vibration during opening and closing of doors.
- C. Support and attach tracks to opening jambs with continuous angle welded to tracks and attached to wall. Support horizontal (ceiling) tracks with continuous angle welded to track and supported by laterally braced attachments to overhead structural members at curve and end of tracks.
- D. Weatherseals: Provide replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and at top of overhead door.
1. In addition, provide continuous flexible seals at door jambs for a weathertight and sound-tight installation.

2. Provide doors with manufacturer's energy conservation package of seals, including side and top seals and bottom gasket.
- E. Windows: Provide windows of type and size indicated and in arrangement shown. Set glazing in vinyl, rubber, or neoprene glazing channel for metal-framed doors, as required. Provide removable stops of same material as door section frames.
  1. Size: Manufacturer's standard panel for type of glazing indicated.

## **2.4 HARDWARE**

- A. General: Provide heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.
- B. Hinges: Provide heavy-duty galvanized steel hinges, of not less than 0.0747-inch- thick uncoated steel, at each end stile and at each intermediate stile, per manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is not possible. Provide double-end hinges, where required, for doors exceeding 16 feet in width, unless otherwise recommended by door manufacturer.
- C. Rollers: Provide heavy-duty rollers, with steel ball bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide 3-inch- diameter roller tires for 3-inch track, 2-inch- diameter roller tires for 2-inch track, and as follows:
  1. Neoprene or bronze tires.
- D. Push/Pull Handles: For push-up-operated or emergency-operated doors, provide galvanized steel lifting handles on each side of door.
- E. Emergency Manual Operation: Chain hoist, chain concealed above ceiling when not in use.
- F. Locks: Fabricate locking device assembly with lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bar to engage through slots in tracks.
  1. Locking Bars: Single-jamb side, operable from inside only.
  2. Lock cylinder is specified in another Division 8 Section.
- G. Power Operated Doors: Where door unit is power operated, provide safety interlock switch to disengage power supply when door is locked.

## **2.5 COUNTERBALANCING MECHANISM**

- A. Torsion Spring: Operation by torsion-spring counterbalance mechanism consisting of adjustable-tension torsion springs, fabricated from oil-tempered-steel wire complying with ASTM A 229, Class II, mounted on a cross-header tube or steel shaft. Connect to door with galvanized aircraft-type lift cables with cable safety factor of at least 5 to 1. Provide springs calibrated for 10,000 cycles minimum.
- B. Bracket: Provide anchor support bracket, as required to connect stationary end of spring to the wall, to level shaft and prevent sag.



- C. Spring Bumper: Provide a spring bumper at each horizontal track to cushion door at end of opening operation.
- D. Lift/Pull Operation: Design counterbalance mechanism so required lift/pull operation does not exceed 25 lbf.

## 2.6 ELECTRIC DOOR OPERATORS

- A. General: Provide electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operational life specified, complete with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
- B. Comply with NFPA 70.
- C. Disconnect Device: Provide hand-operated disconnect or mechanism for automatically engaging sprocket-chain operator and releasing brake for emergency manual operation while disconnecting motor, without affecting timing of limit switch. Mount disconnect and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- D. Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.
- E. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V, ac or dc.
- F. Door-Operator Type: Provide unit consisting of electric motor and the following:
  - 1. Jackshaft type, with V-belt primary reduction, chain intermediate reduction, roller chain drive connected to counterbalance shaft, and floor-level disconnect-release for manual operation using chain hoist.
- G. Electric Motors: Provide high-starting torque, reversible, continuous-duty, Class A insulated, electric motors, complying with NEMA MG 1, with overload protection, sized to start, accelerate, and operate door in either direction, from any position, at not less than 2/3 fps and not more than 1 fps, without exceeding nameplate ratings or considering service factor.
  - 1. Type: Polyphase, medium-induction type.
  - 2. Service Factor: According to NEMA MG 1, unless otherwise indicated.
  - 3. Coordinate wiring requirements and electrical characteristics of motors with building electrical system.
  - 4. Provide open drip-proof-type motor, and controller with NEMA ICS 6, Type 1 enclosure.
  - 5. Provide totally enclosed, non-ventilated or fan-cooled motors, fitted with plugged drain, and controller with NEMA ICS 6, Type 4 enclosure where indicated.

- H. Obstruction Detection Devices: Provide each motorized door with indicated external automatic safety sensors able to protect full width of door opening. Activation of sensors immediately stops and reverses downward door travel.
  - 1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
    - a. Self-Monitoring Type: Provide self-monitoring sensor designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door operates to close only with constant pressure on close button.
  - 2. Sensor Edge: Provide each motorized door with an automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor immediately stops and reverses downward door travel. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
    - a. Provide electrically actuated automatic bottom bar.
      - 1) Self-Monitoring Type: Provide self-monitoring, 4-wire configured device.
- I. Limit Switches: Provide adjustable switches, interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine wall and overhead areas, including opening framing and blocking, with Installer present, for compliance with requirements for installation tolerances, clearances, and other conditions affecting performance of Work of this Section.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. General: Install door, track, and operating equipment complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports according to Shop Drawings, manufacturer's written instructions, and as specified.
- B. Fasten vertical track assembly to framing at not less than 24 inches o.c. Hang horizontal track from structural overhead framing with angle or channel hangers welded and bolt fastened in place. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.

### **3.3 ADJUSTING**

- A. Lubricate bearings and sliding parts; adjust doors to operate easily, free from warp, twist, or distortion and fitting weathertight for entire perimeter.
- B. Adjust belt-driven motors as follows:
  - 1. Use adjustable motor-mounting bases for belt-driven motors.
  - 2. Align pulleys and install belts.
  - 3. Tension belt according to manufacturer's written instructions.

- C. Affix NO stickers to doors or tracks except required safety warnings.

### **3.4 DEMONSTRATION**

- A. Startup Services: Engage a factory-authorized service representative to perform startup services and to train Owner's maintenance personnel as specified below:
  1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
  2. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.
  3. Review data in the maintenance manuals. Refer to Division 1 Section "Contract Closeout."
  4. Review data in the maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
  5. Schedule training with Owner with at least 7 days' advance notice.

**END OF SECTION**

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## SECTION 08 4113

### ALUMINUM ENTRANCES AND STOREFRONTS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following types of aluminum entrance and storefront work:
  - 1. Exterior and interior storefront framing.
  - 2. Storefront framing for punched openings.
  - 3. Exterior and interior manual-swing entrance doors and door-frame units.
- B. Related Sections:
  - 1. Section 07 9200 "Joint Sealants" for sealing between storefront system and the substrate.
  - 2. Section 08 8000 "Glazing" for requirements for aluminum entrances and storefront.
  - 3. Section 08 7100 "Door Hardware" for door hardware to be installed on aluminum doors, except items noted specifically by aluminum door manufacturer. Installation of aluminum door hardware shall be by Aluminum contractor.

##### 1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. General: Provide aluminum entrance and storefront assemblies that comply with performance characteristics specified, as demonstrated by testing the manufacturer's corresponding stock assemblies according to test methods indicated.
- B. Thermal Movement: Design the aluminum entrance and storefront framing systems to provide for expansion and contraction of the component materials. Entrance doors shall function normally over the specified temperature range.
  - 1. The system shall be capable of withstanding a metal surface temperature range of 180 degrees F without buckling, failure of joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance, stress on glass, or other detrimental effects.
- C. Design Requirements: Provide aluminum entrance and storefront systems that comply with structural performance, air infiltration, and water penetration requirements indicated.
  - 1. Wind Loads: Provide aluminum entrance and storefront assemblies capable of withstanding wind pressures of 20 psf inward and 20 psf outward acting normal to the plane of the wall.
- D. Structural Performance: Conduct tests for structural performance in accordance with ASTM E 330. At the conclusion of the tests there shall be no glass breakage or permanent damage to fasteners, anchors, hardware or actuating mechanism. Framing members shall have no permanent deformation in excess of 0.2 percent of their clear span.
  - 1. Deflection Normal to the Plane of the Wall: Test pressure required to measure deflection of framing members normal to the plane of the wall shall be equivalent to the wind load specified above. Deflection shall not exceed 1/175 of the clear span, when subjected to uniform load deflection test.

2. Deflection Parallel to the Plane of the Wall: Test pressures required to measure deflection parallel to the plane of the wall shall be equal to 1.5 times the wind pressures specified above. Deflection of any member carrying its full dead load shall not exceed an amount that will reduce glass bite below 75 percent of the design dimension and shall not reduce the edge clearance between the member and the fixed panel, glass or other fixed member above to less than 1/8 inch. The clearance between the member and an operable door or window shall be at least 1/16 inch.
- E. Air Infiltration: Provide aluminum entrance and storefront framing system with an air infiltration rate of not more than 0.06 CFM per sq. ft. of fixed area (excluding operable door edges) when tested in accordance with ASTM E 283 at an inward test pressure differential of 1.57 psf.
- F. Water Penetration: Provide framing systems with no uncontrolled water penetration (excluding operable door edges) as defined in the test method when tested in accordance with ASTM E 331 at an inward test pressure differential of 6.24 lbf per sq. ft.
- G. Condensation Resistance: Where framing systems are "thermal-break" construction, provide units tested for thermal performance in accordance with AAMA 1503 showing condensation resistance factor (CRF) of not less than 45.

#### 1.4 SUBMITTALS

- A. Product Data: Product data for each aluminum entrance and storefront system required, including:
  1. Manufacturer's standard details and fabrication methods.
  2. Data on finishing, hardware and accessories.
  3. Recommendations for maintenance and cleaning of exterior surfaces.
- B. Shop Drawings: Shop drawings for each aluminum entrance and storefront system required, including:
  1. Layout and installation details, including relationship to adjacent work.
  2. Elevations at 1/4-inch scale.
  3. Detail sections of typical composite members.
  4. Anchors and reinforcement.
  5. Hardware mounting heights.
  6. Provisions for expansion and contraction and for draining moisture occurring within the assembly to the exterior.
  7. Glazing details.
  8. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
    - a. Joinery, including concealed welds.
    - b. Anchorage.
    - c. Expansion provisions.
    - d. Glazing.
    - e. Flashing and drainage.
- D. Samples for Color Selection: Submit pairs of samples of each specified color and finish on 12-inch-long sections of extrusions or formed shapes. Where normal color variations are anticipated, include 2 or more units in each set of samples indicating extreme limits of color variations.
- E. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

- F. Test Reports: Provide certified test reports from a qualified independent testing laboratory showing that aluminum entrance and storefront systems have been tested in accordance with specified test procedures and comply with performance characteristics indicated.

## **1.5 QUALITY ASSURANCE**

- A. Installer Qualifications: Engage an experienced Installer who has completed installations of aluminum storefront and entrances similar in design and extent to those required for the project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer's Qualifications: Provide aluminum entrances and storefront systems produced by a firm experienced in manufacturing systems that are similar to those indicated for this project and that have a record of successful in-service performance.
- C. Single Source Responsibility: Obtain aluminum entrance and storefront systems from one source and from a single manufacturer.
- D. Design Criteria: The drawings indicate the size, profile, and dimensional requirements of aluminum entrance and storefront work required and are based on the specific types and models indicated. Aluminum entrance and storefront by other manufacturers may be considered, provided deviations in dimensions and profiles are minor and do not change the design concept as judged by the Architect. The burden of proof of equality is on the proposer.
- E. Certificate of Assembled U-factor: The installer or supplier on the fenestration system (which includes the glazing as well as the aluminum system) shall provide a signed and dated certificate for the installed fenestration system listing the assembly U-factor, the solar heat gain coefficient and the air leakage rate. This is to meet the exception to the Labeling of Fenestration Products under Item 5.8.2.2 of the ANSI/ASHRA/IESNA STANDARD 90.1-2007 and the requirements of IECC. Energy performance of fenestration must be determined based on criteria of NFRC 100 and 200. For LEED submissions or where windows and doors are to be site-built, furnish certificate of overall product performance generated using NFRC Component Modeling Approach software tool (CMAST).
  - 1. Fenestration systems shall have a maximum assembly U value of 0.40 and a maximum SHGC of 0.23.
  - 2. Certifications reflecting only the center of glass values are not acceptable.
  - 3. Once all site-built components have been installed, but prior to final inspection, the Contractor shall retain an ACE (Approved Calculation Entity) to generate the NFRC label certificate for the project based on the actual products installed.
  - 4. All costs associated with certification of fenestration systems shall be borne by the Contractor.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver aluminum entrance and storefront components in the manufacturer's original protective packaging.
- B. Store aluminum components in a clean dry location away from uncured masonry or concrete. Cover components with waterproof paper, tarpaulin or polyethylene sheeting in a manner to permit circulation of air.
  - 1. Stack framing components in a manner that will prevent bending and avoid significant or permanent damage.

## 1.7 PROJECT CONDITIONS

- A. Field Measurements: Check openings by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of the work
  - 1. Where necessary, proceed with fabrication without field measurements, and coordinate fabrication tolerances to ensure proper fit.

## 1.8 WARRANTY

- A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that deteriorate as defined in this Section within specified warranty period.
  - 1. Failures include, but are not limited to, the following.
    - a. Structural failures including, but not limited to, excessive deflection.
    - b. Noise or vibration caused by thermal movements.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    - d. Water leakage through fixed glazing and framing areas.
    - e. Failure of operating components to function properly.
    - f. Warranty Period: Five years from date of Substantial Completion.
  - 2. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.
    - a. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis of Design: Contract Documents are based on products listed below to establish a standard of quality. Other available manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
  - 1. Manufacturer: Kawneer North American, an Arconic Company.
  - 2. Products:
    - a. Storefront System (Exterior): Trifab Versaglaze 451UT.
    - b. Storefront System (Interior): Trifab Versaglaze 451.
    - c. Entrance Doors and Frames: 500 Heavy Wall.
- B. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering entrance and storefront systems that may be incorporated in the Work include, but are not limited to, the following:
  - 1. Kawneer North American, an Arconic Company.
  - 2. U.S. Aluminum Corp., a division of C.R. Laurence Co., Inc.
  - 3. EFCO Corporation, an Apogee Enterprises company.
  - 4. Oldcastle BuildingEnvelope.

### 2.2 MATERIALS

- A. Aluminum Members: Alloy and temper recommended by the manufacturer for strength, corrosion resistance, and application of required finish; comply with ASTM B 221 for aluminum extrusions, ASTM B 209 for aluminum sheet or plate, and ASTM B 211 for aluminum bars, rods and wire.



- B. Carbon Steel: Carbon steel reinforcement of aluminum framing members shall comply with ASTM A 36 for structural shapes, plates and bars, ASTM A 611 for cold rolled sheet and strip, or ASTM A 570 for hot rolled sheet and strip.
- C. Glass and Glazing Materials: Comply with requirements of "Glass and Glazing" section of these specifications.
- D. Fasteners: Provide fasteners of aluminum, nonmagnetic stainless steel, zinc plated steel, or other material warranted by the manufacturer to be noncorrosive and compatible with aluminum components, hardware, anchors and other components.
  - 1. Reinforcement: Where fasteners screw-anchor into aluminum members less than 0.125 inches thick, reinforce the interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard noncorrosive pressed-in splined grommet nuts.
  - 2. Exposed Fasteners: Do not use exposed fasteners except for application of hardware. For application of hardware, use Phillips flat-head machine screws that match the finish of member or hardware being fastened.
- E. Concealed Flashing: 0.0179-inch (26 gage) minimum dead-soft stainless steel, or 0.026-inch-thick minimum extruded aluminum of alloy and type selected by manufacturer for compatibility with other components.
- F. Brackets and Reinforcements: Provide high-strength aluminum brackets and reinforcements; where use of aluminum is not feasible provide nonmagnetic stainless steel or hot-dip galvanized steel complying with ASTM A 123.
- G. Concrete and Masonry Inserts: Provide cast iron, malleable iron, or hot-dip galvanized steel inserts complying with ASTM A 123.
- H. Compression Weatherstripping: Manufacturer's standard replaceable compressible weatherstripping gaskets of molded neoprene complying with ASTM D 2000 or molded PVC complying with ASTM D 2287.

### **2.3 DOOR HARDWARE**

- A. General: Refer to Division 8 Section "Door Hardware" for door hardware other than those indicated to be provided by the aluminum entrance manufacturer.
- B. Door hardware for aluminum doors shall be installed by aluminum door contractor.

### **2.4 COMPONENTS**

- A. Storefront Framing System: Provide storefront and entrance framing systems fabricated from extruded aluminum members of size and profile indicated. Include subframes and other reinforcing members of the type indicated. Provide for storefront glazed from the exterior on all sides with projecting stops as scheduled. Shop-fabricate and preassemble frame components where possible. Provide storefront frame sections without exposed seams.
  - 1. Mullion Configurations: Provide pockets at the inside glazing face to receive resilient elastomeric glazing. Mullions and horizontals shall be one piece. Make provisions to drain moisture accumulation to the exterior.
  - 2. Provide with structural silicone glazing (SSG) adaptor where indicated on Drawings.

- B. Entrance Door Frames: Provide tubular and channel frame entrance door frame assemblies, as indicated, with welded or mechanical joints in accordance with manufacturer's standards. Reinforce as necessary to support required loads. Entrance doors and frames shall be supplied as a complete system. Frames shall be minimum 3/16 inch wall thickness.
- C. Stile-and-Rail Type Entrance Doors: Provide tubular frame members, fabricated with mechanical joints using heavy inserted reinforcing plates and concealed tie-rods or j-bolts.
  - 1. Glazing: Fabricate doors to facilitate replacement of glass or panels, without disassembly of stiles and rails. Provide snap-on extruded aluminum glazing stops, with exterior stops anchored for nonremoval.
  - 2. Design: Provide 2-inch-thick doors with minimum 3/16 inch wall thickness.

## 2.5 FABRICATION

- A. General: Fabricate aluminum entrance and storefront components to designs, sizes and thicknesses indicated and to comply with indicated standards. Sizes and profile requirements are indicated on the drawings. Variable dimensions are indicated, with maximum and minimum dimensions required, to achieve design requirements and coordination with other work.
  - 1. Thermal-Break Construction: Fabricate exterior storefront framing system with an integrally concealed, low-conductance thermal barrier, located between exterior materials and exposed interior members to eliminate direct metal-to-metal contact. Use manufacturer's standard construction that has been in use for similar projects for period of not less than 3 years.
- B. Prefabrication: Complete fabrication, assembly, finishing, hardware application, and other work to the greatest extent possible before shipment to the Project site. Disassemble components only as necessary for shipment and installation.
  - 1. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work to prevent damage to exposed finish surfaces. Complete these operations for hardware prior to application of finishes.
  - 2. Do not drill and tap for surface-mounted hardware items until time of installation at project site.
- C. Welding: Comply with AWS recommendations. Grind exposed welds smooth to remove weld spatter and welding oxides. Restore mechanical finish.
  - 1. Welding behind finished surfaces shall be performed in such a manner as to minimize distortion and discoloration on the finished surface.
- D. Reinforcing: Install reinforcing as required for hardware and as necessary for performance requirements, sag resistance and rigidity.
- E. Dissimilar Metals: Separate dissimilar metals with bituminous paint, or a suitable sealant, or a nonabsorptive plastic or elastomeric tape, or a gasket between the surfaces. Do not use coatings containing lead.
- F. Continuity: Maintain accurate relation of planes and angles with hairline fit of contacting members.
- G. Fasteners: Conceal fasteners wherever possible.

- H. Weather stripping: For exterior doors, provide compression weather stripping against fixed stops. At other edges, provide sliding weather stripping retained in adjustable strip mortised into door edge.
  - 1. Provide EPDM or vinyl-blade gasket weather stripping in bottom door rail, adjustable for contact with threshold.
  - 2. At interior doors and other locations without weather stripping, provide neoprene silencers on stops to prevent metal-to-metal contact.

## **2.6 FINISHES**

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. AA Designations: Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- D. Exterior - Color Anodic Finish: AAMA 611, AA-M12C22A42/A44.
  - 1. Color: Dark bronze.
  - 2. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- E. Interior - Clear Anodic Finish - AA-M12C22A41 Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I clear coating 0.7 mils or thicker, complying with AAMA 607.1.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates and supports, with the Installer present, for compliance with requirements indicated, installation tolerances, and other conditions that affect installation of aluminum entrances and storefronts. Correct unsatisfactory conditions before proceeding with the installation.
  - 1. Do not proceed with installation until unsatisfactory conditions are corrected.

### **3.2 INSTALLATION**

- A. Comply with manufacturer's instructions and recommendations for installation.
- B. General: Set units plumb, level, and true to line, without warp or rack of framing members, doors, or panels. Install components in proper alignment and relation to established lines and grades indicated. Provide proper support and anchor securely in place.

- C. Construction Tolerances: Install aluminum entrance and storefront to comply with the following tolerances:
1. Variation from Plane: Do not exceed 1/8 inch in 12 feet of length or 1/4 inch in any total length.
  2. Offset from Alignment: The maximum offset from true alignment between two identical members abutting end to end in line shall not exceed 1/16 inch.
  3. Diagonal Measurements: The maximum difference in diagonal measurements shall not exceed 1/8 inch.
  4. Offset at Corners: The maximum out-of-plane offset of framing at corners shall not exceed 1/32 inch.
- D. Separate aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
1. Zinc or cadmium plate steel anchors and other unexposed fasteners after fabrication.
  2. Paint dissimilar metals where drainage from them passes over aluminum.
  3. Paint aluminum surfaces in contact with mortar, concrete or other masonry with alkali resistant coating.
  4. Paint wood and similar absorptive material in contact with aluminum and exposed to the elements or otherwise subject to wetting, with two coats of aluminum house paint. Seal joints between the materials with sealant.
- E. Drill and tap frames and doors and apply surface-mounted hardware items. Comply with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.
- F. Set sill members and other members in bed of sealant as indicated, or with joint fillers or gaskets as indicated to provide weathertight construction. Comply with requirements of Division 7 for sealants, fillers, and gaskets.
- G. Refer to Division 8 Section "Glazing" for installation of glass and other panels indicated to be glazed into doors and framing, and not preglazed by aluminum manufacturer.

### **3.3 ADJUSTING**

- A. Adjust operating hardware to function properly, for smooth operation without binding, and for weathertight closure.

### **3.4 CLEANING**

- A. Clean the completed system, inside and out, promptly after installation, exercising care to avoid damage to coatings.
- B. Clean glass surfaces after installation, complying with requirements contained in the "Glass and Glazing" Section for cleaning and maintenance. Remove excess glazing and sealant compounds, dirt and other substances from aluminum surfaces.

### **3.5 PROTECTION**

- A. Institute protective measures required throughout the remainder of the construction period to ensure that aluminum entrances and storefronts will be without damage or deterioration, other than normal weathering, at time of acceptance.

## **END OF SECTION**

## SECTION 08 4329

### SLIDING ALUMINUM-FRAMED GLASS DOORS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. Section includes sliding aluminum-framed glass doors for interior locations, including inactive leaves (stationary panels) and frames.
- B. Related Requirements:
  - 1. Section 08 4113 "Aluminum Entrances and Storefronts" for coordinating finish among aluminum fenestration units on the building exterior.
  - 2. Section 08 7100 "Door Hardware" for hardware not specified in this section.

##### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

##### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions.
- B. Shop Drawings: For sliding aluminum-framed glass doors.
  - 1. Include plans, elevations, sections, and details.
  - 2. Detail attachments to other work, and between units, if any.
  - 3. Include hardware and required clearances.
- C. Samples for Verification: For sliding aluminum-framed glass doors and components required, prepared on Samples of size indicated below:
  - 1. Main Framing Member: 12-inch- section with glazing bead, and factory-applied color finish.
  - 2. Hardware: Full-size units with factory-applied finish.

##### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Field quality-control reports.

- C. Sample Warranty: For manufacturer's special warranty.

## 1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes, weather stripping, operable panels, and operating hardware to include in maintenance manuals.

## 1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating sliding aluminum-framed glass doors that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.
- B. Installer Qualifications: An installer acceptable to sliding aluminum-framed glass door manufacturer for installation of units required for this Project.

## 1.8 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of sliding aluminum-framed glass doors that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Failure to meet performance requirements.
    - b. Structural failures including excessive deflection.
    - c. Faulty operation of movable panels and hardware.
    - d. Deterioration of metals, metal finishes, and other materials beyond normal wear.
  - 2. Warranty Period:
    - a. Sliding Door: Five years from date of Substantial Completion.
    - b. Aluminum Finish: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis of Design: Contract Documents are based on systems specified below to establish a standard of quality. Other manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
  - 1. Manufacturer: Kawneer, an Arconic company
  - 2. Product: Series 1010 Sliding Mall Front.
- B. Source Limitations: Obtain sliding aluminum-framed glass doors from single source from single manufacturer.

## 2.2 SLIDING ALUMINUM-FRAMED GLASS DOORS

- A. Framing, General:
  - 1. Material: Aluminum extrusions, 6063 alloy.
  - 2. Framing Member Profile: 1-3/8 inch deep frame.
  - 3. Minimum Wall Thickness: 0.070 inch.
- B. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with sliding storefront members, trim hardware, anchors, and other components.
- C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.
- D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.
- E. Sliding-Type Weather Stripping: Provide woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric. Comply with AAMA 701/702.
- F. Weather Seals: Provide weather stripping with integral barrier fin or fins of semi-rigid, polypropylene sheet or polypropylene-coated material. Comply with AAMA 701/702.
- G. Sealant: For sealants required within fabricated sliding storefront, provide sliding storefront manufacturer's standard, permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

## 2.3 GLAZING

- A. Glass and Glazing: Manufacturer's standard glazing system.
  - 1. Glass: ASTM C1036, Type 1, q3, Category II safety glass complying with testing requirements in 16 CFR 1201; 5 mm, ASTM C1048, Kind FT.
    - a. Safety Glazing Labeling: Permanently mark safety glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
  - 2. Tint: Clear, Frosted: Sandblasted and etched back.

## 2.4 HARDWARE

- A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock sliding storefronts.

- B. Standard Hardware:
  - 1. One pair of stainless steel tandem rollers per sliding panel
  - 2. Stainless steel roller track
  - 3. Adams Rite MS 1850A-505 Hookbolt Lock
  - 4. Interior and Exterior Cylinders
  - 5. Flush Face Pulls.

## 2.5 ACCESSORIES

- A. Fasteners: Noncorrosive and compatible with door members, trim, hardware, anchors, and other components.
  - 1. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.
- B. Anchors, Clips, and Accessories: Provide anchors, clips, and accessories of aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron for sliding aluminum-framed glass doors, complying with ASTM B456 or ASTM B633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

## 2.6 FABRICATION

- A. Fabricate sliding aluminum-framed glass doors in sizes indicated. Include a complete system for assembling components and anchoring doors.
- B. Fabricate sliding aluminum-framed glass doors that are reglazable without dismantling panel framing.
- C. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.
- D. Factory-Glazed Fabrication: Glaze sliding aluminum-framed glass doors in the factory where practical and possible for applications indicated. Comply with requirements in Section 088000 "Glazing".

## 2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.



## **2.8 ALUMINUM FINISHES**

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of threshold substrate, and operational clearances.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing doors, hardware, accessories, and other components.
- B. Install sliding aluminum-framed glass doors level, plumb, square, true to line, without distortion, without warp or rack of frames and panels, and without impeding thermal movement; anchored securely in place to structural support; and in proper relation to adjacent construction.
- C. Set sill members in bed of sealant or with gaskets, as indicated, to provide complete construction.
- D. Install sliding aluminum-framed glass doors and components to drain condensation, water penetrating joints, and moisture migrating within doors to the exterior.
- E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

### **3.3 ADJUSTING, CLEANING, AND PROTECTION**

- A. Lubricate hardware and moving parts.
- B. Adjust operating panels to provide a tight fit at contact points and for smooth operation, without binding, and a weathertight closure. Adjust hardware for proper alignment, smooth operation, and proper latching without unnecessary force or excessive clearance.
- C. Clean exposed surfaces immediately after installing sliding aluminum-framed glass doors. Avoid damaging protective coatings and finishes. Remove nonpermanent labels, excess sealants, glazing materials, dirt, and other substances.
- D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

- E. **Protect sliding aluminum-framed glass door surfaces** from contact with contaminating substances resulting from construction operations. If contaminating substances contact sliding aluminum-framed glass door surfaces, remove contaminants immediately according to manufacturer's written instructions.
- F. **Refinish or replace** sliding aluminum-framed glass doors with damaged finishes.
- G. **Replace damaged components.**

**END OF SECTION**

## SECTION 08 6200

### UNIT SKYLIGHTS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. Section Includes:
  - 1. Prefabricated fixed skylights.
- B. Related Sections:
  - 1. Section 07 5419 "Polyvinyl Chloride (PVC) Roofing" for roofing membrane and roofing accessories.

##### 1.3 REFERENCES

- A. Aluminum Association (AA): Specifications for Aluminum Structures.
- B. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE): ASHRAE 90.1 - Energy Standard for Buildings except Low-Rise Residential Buildings.
- C. ASTM International (ASTM): ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- D. National Fenestration Rating Council (NFRC):
  - 1. NFRC 100 - Procedure for Determining Fenestration Product U-Factors.
  - 2. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance of Normal Incidence.
- E. North American Fenestration Standard (NAFS): AAMA/WDMA/CSA 101/I.S.2/A440 - The Voluntary Performance Specification for Windows, Skylights, and Glass Doors.

##### 1.4 PERFORMANCE REQUIREMENTS

- A. Skylights must conform with all federal, state and local code bodies having jurisdiction, and be designed to withstand all forces of nature deemed necessary by those code bodies for the specified project location.
- B. Design skylights to carry a minimum 30 psf tributary roof load or greater per site as specified in the current International Building Code.
- C. Skylights must be tested and labeled in accordance to AAMA/WDMA/CSA 101/I.S.2/A440 as required by the International Building Code.

- D. Drop Test:
1. A 200 lb drop test from a height of 24 inches above the center (highest point) of dome shape and at mid points of both the 5 foot and 6 foot side (approximately 15 inches and 18 inches from center).
  2. The 200 lb load must be contained within a flexible bladder or sack having approximate dimensions no larger than 30 inches long, 20 inches wide, and 8 inches high, filled with course sand or pea gravel.
  3. The dome must withstand the sack drop without inverting or breaking.
  4. Finished skylight domes sealed in frame must also handle 500 lb on 1 square foot point loading without inverting.
  5. The drop test must be witnessed and certified by the test laboratory which provides the NAFS certification.
- E. Skylights must be certified by NFRC and NAFS.

## **1.5 SUBMITTALS**

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
  2. Storage and handling requirements and recommendations.
  3. Installation methods.
- B. Shop Drawings: Submit plan, section, elevation, and perspective drawings as necessary to depict each specified skylight. Include all flashing, connection, and termination details necessary for a proper and complete installation.
- C. Selection Samples: For each finish product specified, two samples representing manufacturer's full range of available colors and finishes.
- D. Verification Samples: For each finish product specified, provide a full size sample representing actual product, color, and finish. Upon acceptance, the sample unit(s) may be used on the project provided no damage has occurred.

## **1.6 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten (10) years' experience.
- B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of the same type and scope as specified.

## **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

## **1.8 PROJECT CONDITIONS**

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

## 1.9 WARRANTY

- A. At project closeout, provide to Owner or Owner's Representative an executed copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.
- B. Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of skylights that fail in materials or workmanship under normal use within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Deterioration of metals, metal finishes, dome, and other materials beyond normal weathering.
    - b. Breakage of polycarbonate glazing.
    - c. Product leaks.
  - 2. Warranty Period:
    - a. 10 Years: Polycarbonate dome skylights including water penetration and hail breakage for hailstones 2 inches and less in diameter and yellowing of acrylic and polycarbonate skylight domes. Mill finished aluminum skylight frames.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other acceptable manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
  - 1. Manufacturer: Kingspan Light + Air, [www.kingspanlightandair.com](http://www.kingspanlightandair.com)
  - 2. Product: Model KAT Series 1113, triple glazed, thermally broken curb mounted.
- B. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering products which may be incorporated into the Work include, but are not limited to, the following:
  - 1. Kingspan
  - 2. Velux

### 2.2 FIXED SKYLIGHT UNITS

- A. Glazing Panels - Triple Glazed:
  - 1. Lens: White polycarbonate over White impact modified prismatic acrylic over White impact modified prismatic acrylic
- B. Performance Requirements
  - 1. Unit Skylight Standard, certified to AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS-17 or previous) as follows:
    - a. Design Pressure (DP): Minimum DP = +/- 30 psf. Dome shall not invert at positive design pressure.
    - b. Water Test Pressure: Minimum 15 psf with no leakage at 5 gallons per minute spray rate.
    - c. Air Leakage Rate: Maximum 0.061 cfm/ft<sup>2</sup>
  - 2. Daylighting: Provide daylighting photometric performance comparable to basis of design product at layout indicated, based upon daylighting profile of March 21, 9:00 am local time, at Project location by simulation in accordance with IESNA guidelines.

3. Fire Testing for Roof Assemblies with Fire Classifications: Polycarbonate unit skylight tested in accordance with and listed as passing Class A Burning Brand test as described in ASTM E 108.
4. Dome Burn Rate: Tested in accordance with ASTM D 635 with a documented rating of CC1 for LuxGuard Plus (polycarbonate)
5. Dome Smoke Density Rating: Testing in accordance with ASTM D 2843 with a documented performance value less than or equal to 75.
6. Dome Self-Ignition Temperature: Tested in accordance with ASTM D 1929 with a documented performance value greater than or equal to 650 degrees Fahrenheit.
7. Dome Hail Resistance: Exterior dome tested in accordance with Factory Mutual 4430 to meet severe hail with 2.0 inch ice balls.
8. Energy Performance ratings for any size commercial CMD- curb mounted unit skylight with dynamic dome as follows:
  - a. Thermal Transmittance: NFRC 100 maximum U-factor:
    - 1) Not greater than 0.50.
  - b. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum SHGC:
    - 1) Not greater than 0.40.
9. Fall Protection Standard Compliance: 29 CFR 1910.29: Skylight, safety screen tested to support a minimum of 400 pounds over 1 square foot of the surface.

## **2.3 ACCESSORIES**

- A. Fasteners (For anchorage of skylight to roof curb): #12 x 1 1/2 inch 300 series stainless steel screws with washers. Provide fasteners in sufficient quantity for complete installation.
- B. Washers: Neoprene/stainless steel bonded washers.
- C. Fall Protection: External fall protection guard fabricated of 3-gauge galvanized steel wire in a 4-inch x 4-inch grid; sized to fit skylight and mounted to the exterior.

## **2.4 FABRICATION**

- A. Skylights must be factory assembled and glazed ready for installation.
- B. Fabricate skylights weather tight and free of visual distortions and defects.
- C. Protect exterior drip / counter flashing and drainage ports from weather and air-borne debris.
- D. Miter and full penetration weld all corners of curb and retaining frames.
- E. Retaining frames that secure the glazing panels along each side under spring tension need not be welded but must be sealed with a silicone sealant along the full perimeter of the retaining frame. Skylight frames must be pre-drilled for anchorage to roof curbs.
- F. Seal glazing panels to base frame allowing for sufficient expansion and contraction. Provide exterior weep hole arrangement.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Do not begin installation until substrates have been properly prepared.

- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### **3.2 PREPARATION**

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

### **3.3 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.

### **3.4 PROTECTION**

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

**END OF SECTION**

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## SECTION 087100 - DOOR HARDWARE

### PART 1 - GENERAL

#### 1.01 SUMMARY

##### A. Section includes:

1. Mechanical and electrified door hardware
2. Electronic access control system components

##### B. Section excludes:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

##### C. Related Sections:

1. Division 01 Section "Alternates" for alternates affecting this section.
2. Division 06 Section "Rough Carpentry"
3. Division 06 Section "Finish Carpentry"
4. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
5. Division 08 Sections:
  - a. "Metal Doors and Frames"
  - b. "Flush Wood Doors"
  - c. "Interior Aluminum Doors and Frames"
  - d. "Aluminum-Framed Entrances and Storefronts"
6. Division 26 "Electrical" sections for connections to electrical power system and for low-voltage wiring.
7. Division 28 "Electronic Safety and Security" sections for coordination with other components of electronic access control system and fire alarm system.

#### 1.02 REFERENCES

##### A. UL LLC

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

##### B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Keying Systems and Nomenclature
4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association

1. NFPA 70 – National Electric Code
2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 – Life Safety Code
4. NFPA 105 – Smoke and Draft Control Door Assemblies
5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:
  - a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
  - b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
  - a. Wiring Diagrams: For power, signal, and control wiring and including:
    - 1) Details of interface of electrified door hardware and building safety and security systems.
    - 2) Schematic diagram of systems that interface with electrified door hardware.
    - 3) Point-to-point wiring.
    - 4) Risers.
3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.
  - a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
4. Door Hardware Schedule:
  - a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.

- b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
  - c. Indicate complete designations of each item required for each opening, include:
    - 1) Door Index: door number, heading number, and Architect's hardware set number.
    - 2) Quantity, type, style, function, size, and finish of each hardware item.
    - 3) Name and manufacturer of each item.
    - 4) Fastenings and other pertinent information.
    - 5) Location of each hardware set cross-referenced to indications on Drawings.
    - 6) Explanation of all abbreviations, symbols, and codes contained in schedule.
    - 7) Mounting locations for hardware.
    - 8) Door and frame sizes and materials.
    - 9) Degree of door swing and handing.
    - 10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.
5. Key Schedule:
- a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
  - b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
  - c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
  - d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
  - e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
  - f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.
- C. Informational Submittals:
- 1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
  - 2. Provide Product Data:
    - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
    - b. Include warranties for specified door hardware.
- D. Closeout Submittals:
- 1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
    - a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
    - b. Catalog pages for each product.
    - c. Final approved hardware schedule edited to reflect conditions as installed.
    - d. Final keying schedule
    - e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
    - f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

E. Inspection and Testing:

1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
  - a. Fire door assemblies, in compliance with NFPA 80.
  - b. Required egress door assemblies, in compliance with NFPA 101.

1.04 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
  - a. For door hardware: DHI certified AHC or DHC.
  - b. Can provide installation and technical data to Architect and other related subcontractors.
  - c. Can inspect and verify components are in working order upon completion of installation.
  - d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.
4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

1. Fire-Rated Door Openings:
  - a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
  - b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.
2. Smoke and Draft Control Door Assemblies:
  - a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
  - b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.
3. Electrified Door Hardware

- a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
- 4. Accessibility Requirements:
  - a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.
- C. Pre-Installation Meetings
  - 1. Keying Conference
    - a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
      - 1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
      - 2) Preliminary key system schematic diagram.
      - 3) Requirements for key control system.
      - 4) Requirements for access control.
      - 5) Address for delivery of keys.
  - 2. Pre-installation Conference
    - a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
    - b. Inspect and discuss preparatory work performed by other trades.
    - c. Inspect and discuss electrical roughing-in for electrified door hardware.
    - d. Review sequence of operation for each type of electrified door hardware.
    - e. Review required testing, inspecting, and certifying procedures.
    - f. Review questions or concerns related to proper installation and adjustment of door hardware.
  - 3. Electrified Hardware Coordination Conference:
    - a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.
- B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.
- C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
- D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
- E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

- F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

#### 1.06 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

#### 1.07 WARRANTY

- A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.
  - 1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
  - 2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.
    - a. Mechanical Warranty
      - 1) Locks
        - a) Schlage L Series: 3 years
        - b) MARKS 195 Series: Limited Lifetime
      - 2) Exit Devices
        - a) Von Duprin: 3 years
      - 3) Closers
        - a) LCN 4000 Series: 30 years
      - 4) Automatic Operators
        - a) LCN: 2 years
    - b. Electrical Warranty
      - 1) Locks
        - a) Marks: 1 year
      - 2) Exit Devices
        - a) Von Duprin: 1 year

#### 1.08 MAINTENANCE

- A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.
- B. Turn over unused materials to Owner for maintenance purposes.

### PART 2 - PRODUCTS

## 2.01 MANUFACTURERS

- A. The Owner requires use of certain products for their unique characteristics and project suitability to ensure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute."
  - 1. Where "No Substitute" is noted, submittals and substitution requests for other products will not be considered.
- B. Approval of alternate manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category are only to be considered by official substitution request in accordance with section 01 25 00.
- C. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.
- D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

## 2.02 MATERIALS

- A. Fabrication
  - 1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer's recognized installation standards for application intended.
  - 2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
  - 3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with "Metal Doors and Frames", "Flush Wood Doors", "Stile and Rail Wood Doors" to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.
- B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
  - 1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.
- C. Cable and Connectors:
  - 1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
  - 2. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.
  - 3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

## 2.03 HINGES

### A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. Ives 5BB series
2. Acceptable Manufacturers and Products:
  - a. No Substitute

### B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
  - a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
  - b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high
4. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
  - a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
  - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
5. 2 inches or thicker doors:
  - a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
  - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
6. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
7. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
8. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
  - a. Steel Hinges: Steel pins
  - b. Non-Ferrous Hinges: Stainless steel pins
  - c. Out-Swinging Exterior Doors: Non-removable pins
  - d. Out-Swinging Interior Lockable Doors: Non-removable pins
  - e. Interior Non-lockable Doors: Non-rising pins
9. Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

## 2.04 CONTINUOUS HINGES

### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. No Substitute

### B. Requirements:

1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.



2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
5. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
6. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
7. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

## 2.05 ELECTRIC POWER TRANSFER

### A. Manufacturers:

1. Scheduled Manufacturer and Product:
  - a. Von Duprin EPT-10
2. Acceptable Manufacturers and Products:
  - a. No Substitute

### B. Requirements:

1. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
2. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

## 2.06 FLUSH BOLTS

### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. No Substitute

### B. Requirements:

1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

## 2.07 COORDINATORS

A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. No Substitute

B. Requirements:

1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head.
2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for parallel arm door closers, surface vertical rod exit device strikes, or other stop mounted hardware. Factory-prepared coordinators for vertical rod devices as specified.

## 2.08 MORTISE LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. Schlage L9000 series
2. Acceptable Manufacturers and Products:
  - a. No Substitute

B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3-hour fire doors.
2. Indicators: Where specified, provide indicator window measuring a minimum 2-inch x 1/2 inch with 180-degree visibility. Provide messages color-coded with full text and/or symbols, as scheduled, for easy visibility.
3. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
4. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
5. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1-inch (25 mm) throw, constructed of stainless steel.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide switches and sensors integrated into the locks and latches.
7. Provide motor based electrified locksets that comply with the following requirements:
  - a. Universal input voltage – single chassis accepts 12 or 24VDC to allow for changes in the field without changing lock chassis.
  - b. Fail Safe/Fail Secure – changing mode between electrically locked (fail safe) and electrically unlocked (fail secure) is field selectable without opening the lock case.
  - c. Low maximum current draw – maximum 0.4 amps to allow for multiple locks on a single power supply.
  - d. Low holding current – maximum 0.01 amps to produce minimal heat, eliminate "hot levers" in electrically locked applications, and to provide reliable operation in wood doors that provide minimal ventilation and air flow.

- e. Connections – provide quick-connect Molex system standard.
- 8. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.
  - a. Lever Design: Schlage 06A.

## 2.09 CYLINDRICAL LOCKS – GRADE 1

### A. Manufacturers and Products:

- 1. Scheduled Manufacturer and Product:
  - a. Marks 195
- 2. Acceptable Manufacturers and Products:
  - a. Schlage ND series

### B. Requirements:

- 1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour fire doors.
- 2. Cylinders: Refer to "KEYING" article, herein.
- 3. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
- 4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
- 5. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
- 6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
- 7. Provide electrified options as scheduled in the hardware sets.
- 8. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.
  - a. Provide levers that return to within 1/2 inch (13 mm) of door face.
  - b. Vandlgard: Provide levers with vandal resistant technology for use at heavy traffic or abusive applications.
  - c. Lever Design: Marks 195 Series.

## 2.10 DEADBOLTS

### A. Manufacturers and Products:

- 1. Scheduled Manufacturer and Product:
  - a. Schlage B600 Series
- 2. Acceptable Manufacturers and Products:
  - a. Marks

### B. Requirements:

- 1. Provide grade 1 deadbolt series conforming to ANSI/BHMA A156.
- 2. Cylinders: Refer to "KEYING" article, herein.
- 3. Provide deadbolts with standard 2-3/4 inches (70 mm) backset. Provide 2-3/8 inches (60 mm) where noted or if door or frame detail requires. Provide deadbolt with full 1-inch (25 mm) throw, constructed of steel alloy.
- 4. Provide manufacturer's standard strike.

## 2.11 EXIT DEVICES

### A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. Von Duprin 98 series
2. Acceptable Manufacturers and Products:
  - a. No Substitute

### B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide smooth touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
7. Provide flush end caps for exit devices.
8. Provide exit devices with manufacturer's approved strikes.
9. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
11. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
12. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.
15. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
16. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.
17. Special Options:
  - a. XP
    - 1) Rim Exit Devices: provide devices with non-tapered smart latchbolt with 90° latchbolt to strike engagement under stress and Static Load Resistance of 2000 pounds.
  - b. CVC
    - 1) Provide cable-actuated concealed vertical latch system in two-point for non-rated or fire rated wood doors up to a 90 minute rating and less bottom latch (LBL) configuration for non-rated or fire rated wood doors up to 20 minute rating. Vertical rods not permitted.
      - a) Cable: Stainless steel with abrasive resistant coating. Conduit and core wire ends snap into latch and center slides without use of tools.

- b) Wood Door Prep: Maximum 1 inch x 1.1875 inch x 3.875 inches top latch pocket and 1 inch x 1.1875 inch x 5 inches bottom latch pocket which does not require the use of a metal wrap or edge for non-rated or fire rated wood doors up to a 45 minute rating.
- c) Latchbolts and Blocking Cams: Manufactured from sintered metal low carbon copper- infiltrated steel, with molybdenum disulfide low friction coating.
- d) Top Latchbolt: Minimum 0.38 inch (10 mm) and greater than 90-degree engagement with strike to prevent door and frame separation under high static load.
- e) Bottom Latchbolt: Minimum of 0.44-inch (11 mm) engagement with strike.
- f) Product Cycle Life: 1,000,000 cycles.
- g) Latch Operation: Top and bottom latch operate independently of each other. Top latch fully engages top strike even when bottom latch is compromised. Separate trigger mechanisms not permitted.
- h) Latch release does not require separate trigger mechanism.
- i) Cable and latching system characteristics:
  - i. Installed independently of exit device installation, and capable of functioning on door prior to device and trim installation.
  - ii. Connected to exit device at single point in steel and aluminum doors, and two points for top and bottom latches in wood doors.
  - iii. Bottom latch height adjusted, from single point for steel and aluminum doors and two points for wood doors, after system is installed and connected to exit device, while door is hanging
  - iv. Bottom latch position altered up and down minimum of 2 inches (51 mm) in steel and aluminum doors without additional adjustment. Bottom latch deadlocks in every adjustment position in wood doors.
  - v. Top and bottom latches in steel and aluminum doors and top latch in wood doors may be removed while door is hanging.

## 2.12 CYLINDERS

### A. Manufacturers and Products:

- 1. Scheduled Manufacturer and Product:
  - a. Schlage Everest 29 T135 For Interior Doors
  - b. Schlage Everest 29 T135 For Exterior Doors
- 2. Acceptable Manufacturers and Products:
  - a. No Substitute

### B. Requirements:

- 1. Provide cylinders/cores compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset; manufacturer's series as indicated. Refer to "KEYING" article, herein.
- 2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.
  - a. Patented Restricted: cylinder with permanent core with patented, restricted keyway.
- 3. Patent Protection: Cylinders/cores requiring use of restricted, patented keys, patent protected.
- 4. Nickel silver bottom pins.

## 2.13 KEYING

A. Scheduled System:

1. New factory registered system:
  - a. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:

1. Construction Keying:
  - a. Temporary Construction Cylinder Keying.
    - 1) Provide construction cores that permit voiding construction keys without cylinder removal, furnished in accordance with the following requirements.
      - a) Split Key or Lost Ball Construction Keying System.
      - b) 3 construction control keys, and extractor tools or keys as required to void construction keying.
      - c) 12 construction change (day) keys.
    - 2) Owner or Owner's Representative will void operation of temporary construction keys.
2. Permanent Keying:
  - a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
    - 1) Master Keying system as directed by the Owner.
  - b. Forward biting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
  - c. Provide keys with the following features:
    - 1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
    - 2) Patent Protection: Keys and blanks protected by one or more utility patent(s).
    - 3) Geographically Exclusive: Where High Security or Security cylinders/cores are indicated, provide nationwide, geographically exclusive key system complying with the following restrictions.
  - d. Identification:
    - 1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
    - 2) Identification stamping provisions must be approved by the Architect and Owner.
    - 3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
    - 4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
    - 5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
  - e. Quantity: Furnish in the following quantities.
    - 1) Master Keys: 6.
    - 2) Change (Day) Keys: 3 per cylinder/core that is keyed differently
    - 3) Key Blanks: Quantity as determined in the keying meeting.

## 2.14 KEY CONTROL SYSTEM

A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Telkee

2. Acceptable Manufacturers:
  - a. HPC
  - b. Lund
- B. Requirements:
  1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.
    - a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
    - b. Provide hinged-panel type cabinet for wall mounting.

## 2.15 DOOR CLOSERS

- A. Manufacturers and Products:
  1. Scheduled Manufacturer and Product:
    - a. LCN 4040XP series
  2. Acceptable Manufacturers and Products:
    - a. No Substitute
- B. Requirements:
  1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
  2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
  3. Cylinder Body: 1-1/2-inch (38 mm) diameter piston with 5/8-inch (16 mm) diameter double heat-treated pinion journal. QR code with a direct link to maintenance instructions.
  4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
  5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards. Provide snap-on cover clip, with plastic covers, that secures cover to spring tube.
  6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck. Provide graphically labelled instructions on the closer body adjacent to each adjustment valve. Provide positive stop on reg valve that prevents reg screw from being backed out.
  7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
  8. Pressure Relief Valve (PRV) Technology: Not permitted.
  9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
  10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

## 2.16 ELECTRO-HYDRAULIC AUTOMATIC OPERATORS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. LCN 4600 series
2. Acceptable Manufacturers and Products:
  - a. No Substitute

B. Requirements:

1. Provide low energy automatic operator units with hydraulic closer complying with ANSI/BHMA A156.19.
2. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
3. Provide units with conventional door closer opening and closing forces unless power operator motor is activated. Provide door closer assembly with adjustable spring size, back-check, and opening and closing speed adjustment valves to control door
4. Provide units with on/off switch for manual operation, motor start up delay, vestibule interface delay, electric lock delay, and door hold open delay.
5. Provide drop plates, brackets, and adapters for arms as required for details.
6. Provide actuator switches and receivers for operation as specified.
7. Provide weather-resistant actuators at exterior applications.
8. Provide key switches with LED's, recommended and approved by manufacturer of automatic operator as required for function described in operation description of hardware group below. Cylinders: Refer to "KEYING" article, herein.
9. Provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of automatic operator for each individual leaf. Actuators control both doors simultaneously at pairs. Sequence operation of exterior and vestibule doors with automatic operators to allow ingress or egress through both sets of openings as directed by Architect. Locate actuators, key switches, and other controls as directed by Architect.
10. Provide units with vestibule inputs that allow sequencing operation of two units, and SPDT relay for interfacing with latching or locking devices.

## 2.17 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. No Substitute
  - b. Trimco
  - c. Rockwood

B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.



## 2.18 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

### A. Manufacturers:

1. Scheduled Manufacturers:
  - a. Glynn-Johnson
2. Acceptable Manufacturers:
  - a. No Substitute

### B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.

## 2.19 DOOR STOPS AND HOLDERS

### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Trimco
  - b. Rockwood

### B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button or thumbturn.
2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

## 2.20 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Zero International
2. Acceptable Manufacturers:
  - a. National Guard
  - b. Pemko

### B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

#### 2.21 SILENCERS

##### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Rockwood
  - b. Trimco

##### B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

#### 2.22 MAGNETIC HOLDERS

##### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. LCN
2. Acceptable Manufacturers:
  - a. No Substitute

##### B. Requirements:

1. Provide wall or floor mounted electromagnetic door release as specified with minimum of 25 pounds of holding force. Coordinate projection of holder and armature with other hardware and wall conditions to ensure that door sits parallel to wall when fully open. Connect magnetic holders on fire-rated doors into the fire control panel for fail-safe operation.

#### 2.23 COAT HOOKS

##### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Rockwood

##### B. Provide coat hooks as specified.

## 2.24 FINISHES

- A. FINISH: BHMA 626/652 (US26D) AT DOORS OTHER THAN EXTERIOR STOREFRONT;  
EXCEPT:
  - 1. Hinges at Exterior Doors: BHMA 630 (US32D)
  - 2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
  - 3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
  - 4. Protection Plates: BHMA 630 (US32D)
  - 5. Overhead Stops and Holders: BHMA 630 (US32D)
  - 6. Door Closers: Powder Coat to Match
  - 7. Wall Stops: BHMA 630 (US32D)
  - 8. Latch Protectors: BHMA 630 (US32D)
  - 9. Weatherstripping: Clear Anodized Aluminum
  - 10. Thresholds: Mill Finish Aluminum
  
- B. FINISH: BHMA 710/313 AT EXTERIOR STOREFRONT DOORS; EXCEPT:
  - 1. 1. Door Closers: Powder Coat to Match.
  - 2. 2. Weatherstripping: Dark Bronze Anodized Aluminum.
  - 3. 3. Thresholds: Extruded Architectural Bronze, Oil-Rubbed

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.
  
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
  
- C. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
  - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
  - 2. Custom Steel Doors and Frames: HMMA 831.
  - 3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
  - 4. Installation Guide for Doors and Hardware: DHI TDH-007-20
  
- B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.

- C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
- D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
- E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
- F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
- H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.
- I. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:
  - 1. Conduit, junction boxes and wire pulls.
  - 2. Connections to and from power supplies to electrified hardware.
  - 3. Connections to fire/smoke alarm system and smoke evacuation system.
  - 4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
  - 5. Connections to panel interface modules, controllers, and gateways.
  - 6. Testing and labeling wires with Architect's opening number.
- J. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- K. Door Closers & Auto Operators: Mount closers/operators on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers/operators so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.
- L. Overhead Stops/ HOLDERS: Mount overhead stops/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
- M. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
- N. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- O. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
- P. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- Q. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

- R. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

### 3.03 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
  - 1. Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.
  - 2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
  - 3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

### 3.04 CLEANING AND PROTECTION



- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items per manufacturer's instructions to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

### 3.05 DOOR HARDWARE SCHEDULE

- A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.
- B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.
- C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.
- D. Hardware Sets:

101950 OPT0325271 Version 4

Legend:










-  Link to catalog cut sheet
-  Electrified Opening

Hardware Group No. 01

For use on Door #(s):

1207A            1207B

Provide each door(s) with the following:










| QTY |     | DESCRIPTION          | CATALOG NUMBER             |   | FINISH | MFR |
|-----|-----|----------------------|----------------------------|---|--------|-----|
| 3   | EA  | HINGE                | 5BB1HW 4.5 X 4.5 NRP       |  | 630    | IVE |
| 1   | EA  | PANIC HARDWARE       | LD-XP98-NL                 |  | 626    | VON |
| 1   | EA  | RIM CYLINDER         | 20-022 EV29 T              |  | 626    | SCH |
| 1   | EA  | SURFACE CLOSER       | 4040XP SCUSH MC            |  | 689    | LCN |
| 1   | EA  | RAIN DRIP            | 142AA (AS REQ'D)           |  | AA     | ZER |
| 1   | SET | GASKETING            | 429 @ HEAD & JAMBS         |  | AA     | ZER |
| 1   | EA  | DOOR SWEEP           | 39A                        |  | A      | ZER |
| 1   | EA  | THRESHOLD            | 655A - OR PER SILL DETAILS |  | A      | ZER |
| 1   | EA  | DOOR POSITION SWITCH | BY DIVISION 28.            |  |        |     |

Hardware Group No. 02

For use on Door #(s):

1327            1420

Provide each door(s) with the following:

| QTY |     | DESCRIPTION          | CATALOG NUMBER             |   | FINISH | MFR |
|-----|-----|----------------------|----------------------------|---|--------|-----|
| 3   | EA  | HINGE                | 5BB1HW 4.5 X 4.5 NRP       |  | 630    | IVE |
| 1   | EA  | STOREROOM LOCK       | 195 F                      |   | 626    | MKS |
| 1   | EA  | KIL CYLINDER         | 40-100 EV29 T135           |   | 626    | SCH |
| 1   | EA  | LOCK GUARD           | LG12                       |  | 630    | IVE |
| 1   | EA  | SURFACE CLOSER       | 4040XP EDA MC              |  | 689    | LCN |
| 1   | EA  | FLOOR STOP           | FS18S                      |  | BLK    | IVE |
| 1   | EA  | RAIN DRIP            | 142AA (AS REQ'D)           |  | AA     | ZER |
| 1   | SET | GASKETING            | 429 @ HEAD & JAMBS         |  | AA     | ZER |
| 1   | EA  | DOOR SWEEP           | 39A                        |  | A      | ZER |
| 1   | EA  | THRESHOLD            | 655A - OR PER SILL DETAILS |  | A      | ZER |
| 1   | EA  | DOOR POSITION SWITCH | BY DIVISION 28.            |  |        |     |







Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 03

For use on Door #(s):

1208

Provide each door(s) with the following:







| QTY |     | DESCRIPTION    | CATALOG NUMBER             |   | FINISH | MFR |
|-----|-----|----------------|----------------------------|---|--------|-----|
| 3   | EA  | HINGE          | 5BB1HW 4.5 X 4.5 NRP       |  | 630    | IVE |
| 1   | EA  | STOREROOM LOCK | 195 F                      |   | 626    | MKS |
| 1   | EA  | KIL CYLINDER   | 40-100 EV29 T135           |   | 626    | SCH |
| 1   | EA  | SURFACE CLOSER | 4040XP SCUSH MC            |  | 689    | LCN |
| 1   | EA  | RAIN DRIP      | 142AA (AS REQ'D)           |  | AA     | ZER |
| 1   | SET | GASKETING      | 429 @ HEAD & JAMBS         |  | AA     | ZER |
| 1   | EA  | DOOR SWEEP     | 39A                        |  | A      | ZER |
| 1   | EA  | THRESHOLD      | 655A - OR PER SILL DETAILS |  | A      | ZER |

Hardware Group No. 04

For use on Door #(s):

1206C

Provide each door(s) with the following:

| QTY |    | DESCRIPTION    | CATALOG NUMBER             |   | FINISH | MFR |
|-----|----|----------------|----------------------------|---|--------|-----|
| 3   | EA | HINGE          | 5BB1HW 4.5 X 4.5 NRP       |    | 630    | IVE |
| 1   | EA | STOREROOM LOCK | 195 F                      |   | 626    | MKS |
| 1   | EA | KIL CYLINDER   | 40-100 EV29 T135           |   | 626    | SCH |
| 1   | EA | LOCK GUARD     | LG12                       |  | 630    | IVE |
| 1   | EA | SURFACE CLOSER | 4040XP SCUSH MCSRI         |  | 689    | LCN |
| 1   | EA | DOOR SWEEP     | 39A                        |  | A      | ZER |
| 1   | EA | THRESHOLD      | 655A - OR PER SILL DETAILS |  | A      | ZER |
| 3   | EA | SILENCER       | SR64                       |  | GRY    | IVE |

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 05

For use on Door #(s):

1222C

Provide each door(s) with the following:

| QTY |     | DESCRIPTION                      | CATALOG NUMBER              |  | FINISH | MFR |
|-----|-----|----------------------------------|-----------------------------|--|--------|-----|
| 3   | EA  | HINGE                            | 5BB1HW 4.5 X 4.5 NRP        |  | 630    | IVE |
| 1   | EA  | POWER TRANSFER                   | EPT10 CON                   |  | ↗ 689  | VON |
| 1   | EA  | ELECTRIFIED LOCKSET              | EA195 FEU REX               |  | ↗ 626  | MKS |
| 1   | EA  | KIL CYLINDER                     | 40-100 EV29 T135            |  | 626    | SCH |
| 1   | EA  | LOCK GUARD                       | LG12                        |  | 630    | IVE |
| 1   | EA  | SURFACE CLOSER                   | 4040XP SCUSH MC             |  | 689    | LCN |
| 1   | EA  | RAIN DRIP                        | 142AA (AS REQ'D)            |  | AA     | ZER |
| 1   | SET | GASKETING                        | 429 @ HEAD & JAMBS          |  | AA     | ZER |
| 1   | EA  | DOOR SWEEP                       | 39A                         |  | A      | ZER |
| 1   | EA  | THRESHOLD                        | 655A - OR PER SILL DETAILS  |  | A      | ZER |
| 1   | EA  | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED) |  | ↗      | SCH |
| 1   | EA  | POWER SUPPLY WIRE HARNESS        | CON-6W                      |  | ↗      | SCH |
| 1   | EA  | CREDENTIAL READER                | BY DIVISION 28.             |  | ↗      |     |
| 1   | EA  | DOOR POSITION SWITCH             | BY DIVISION 28.             |  | ↗      |     |
| 1   | EA  | LOW VOLTAGE POWER                | BY LOW VOLTAGE              |  | ↗      |     |

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED  
 PRESENTING VALID CREDENTIAL TEMPORALLY RELEASES LEVER FOR ENTRY  
 DOOR IS MONITORED THROUGH ACCESS CONTROL OR SECURITY SYSTEM  
 DOOR IS SECURED UPON LOSS OF POWER TO THE LOCK  
 FREE EGRESS AT ALL TIMES

Hardware Group No. 06

For use on Door #(s):

1222D

Provide each door(s) with the following:

| QTY |     | DESCRIPTION    | CATALOG NUMBER             |  | FINISH | MFR |
|-----|-----|----------------|----------------------------|--|--------|-----|
| 3   | EA  | HINGE          | 5BB1HW 5 X 4.5 NRP         |  | 630    | IVE |
| 1   | EA  | STOREROOM LOCK | 195 F                      |  | 626    | MKS |
| 1   | EA  | KIL CYLINDER   | 40-100 EV29 T135           |  | 626    | SCH |
| 1   | EA  | SURFACE CLOSER | 4040XP SHCUSH MC           |  | 689    | LCN |
| 1   | EA  | KICK PLATE     | 8400 10" X 2" LDW B-CS     |  | 630    | IVE |
| 1   | EA  | RAIN DRIP      | 142AA (AS REQ'D)           |  | AA     | ZER |
| 1   | SET | GASKETING      | 429 @ HEAD & JAMBS         |  | AA     | ZER |
| 1   | EA  | DOOR SWEEP     | 39A                        |  | A      | ZER |
| 1   | EA  | THRESHOLD      | 655A - OR PER SILL DETAILS |  | A      | ZER |

DOOR MAY BE HELD OPEN WITH CLOSER ARM

I












Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 07

For use on Door #(s):

1206B

Provide each door(s) with the following:









| QTY |    | DESCRIPTION             | CATALOG NUMBER             |   | FINISH | MFR |
|-----|----|-------------------------|----------------------------|---|--------|-----|
| 6   | EA | HINGE                   | 5BB1HW 4.5 X 4.5 NRP       |  | 630    | IVE |
| 2   | EA | MANUAL FLUSH BOLT       | FB458                      |  | 626    | IVE |
| 1   | EA | DUST PROOF STRIKE       | DP1 OR DP2 AS REQ'D        |  | 626    | IVE |
| 2   | EA | OH STOP                 | 90S                        |  | 630    | GLY |
| 1   | EA | SURFACE CLOSER          | 4040XP SCUSH MCSRI         |  | 689    | LCN |
| 2   | EA | DOOR SWEEP              | 39A                        |  | A      | ZER |
| 1   | EA | OVERLAPPING<br>ASTRAGAL | 43STST                     |  | STST   | ZER |
| 1   | EA | THRESHOLD               | 655A - OR PER SILL DETAILS |  | A      | ZER |
| 2   | EA | SILENCER                | SR64                       |  | GRY    | IVE |

Hardware Group No. 08

For use on Door #(s):

1202B

Provide each door(s) with the following:

| QTY |     | DESCRIPTION          | CATALOG NUMBER             |   | FINISH | MFR |
|-----|-----|----------------------|----------------------------|---|--------|-----|
| 3   | EA  | HINGE                | 5BB1HW 4.5 X 4.5 NRP       |  | 630    | IVE |
| 1   | EA  | PANIC HARDWARE       | LD-XP98-EO-EMERG EXIT RSS  |  | 626    | VON |
| 1   | EA  | SURFACE CLOSER       | 4040XP SCUSH MC            |  | 689    | LCN |
| 1   | SET | GASKETING            | 429 @ HEAD & JAMBS         |  | AA     | ZER |
| 1   | EA  | DOOR SWEEP           | 39A                        |  | A      | ZER |
| 1   | EA  | THRESHOLD            | 655A - OR PER SILL DETAILS |  | A      | ZER |
| 1   | EA  | DOOR POSITION SWITCH | BY DIVISION 28.            |  |        |     |
| 1   | EA  | EXTERNAL ALARM       | BY DIVISION 28.            |  |        |     |

CONNECT DOOR POSITION SWITCH TO ALARM SYSTEM

OPERATION:

EMERGENCY EXIT ONLY

OPENING DOOR SOUNDS EXTERNAL ALARM

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 09

For use on Door #(s):

1105

Provide each door(s) with the following:

| QTY |    | DESCRIPTION                      | CATALOG NUMBER              |  | FINISH | MFR |
|-----|----|----------------------------------|-----------------------------|--|--------|-----|
| 3   | EA | HINGE                            | 5BB1HW 4.5 X 4.5            |  | 652    | IVE |
| 1   | EA | POWER TRANSFER                   | EPT10 CON                   |  | ↗ 689  | VON |
| 1   | EA | ELEC PANIC HARDWARE              | LD-98-L-M996-06-FSE-CON     |  | ↗ 626  | VON |
| 1   | EA | RIM CYLINDER                     | 20-022 EV29 T               |  | 626    | SCH |
| 1   | EA | SURFACE CLOSER                   | 4040XP SCUSH MC             |  | 689    | LCN |
| 1   | EA | KICK PLATE                       | 8400 10" X 2" LDW B-CS      |  | 630    | IVE |
| 1   | EA | GASKETING                        | 488SBK PSA                  |  | BK     | ZER |
| 1   | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED) |  | ↗      | SCH |
| 1   | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                      |  | ↗      | SCH |
| 1   | EA | CREDENTIAL READER                | BY DIVISION 28.             |  | ↗      |     |
| 1   | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE              |  | ↗      |     |

USE SPRING CUSH ARM TO STOP DOOR

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED  
 PRESENTING VALID CREDENTIAL TEMPORARILY RELEASES LEVER FOR ENTRY  
 DOOR IS SECURED UPON LOSS OF POWER TO THE TRIM  
 FREE EGRESS AT ALL TIMES

Hardware Group No. 10

For use on Door #(s):

|       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 1315A | 1319A | 1320A | 1324A | 1401A | 1403A |
| 1405A | 1407A | 1412A | 1414A | 1415A | 1417A |
| 2301A | 2303A | 2305A | 2307A | 2312A | 2314A |
| 2315A | 2317A | 2323B | 2401A | 2403A | 2405A |
| 2407A | 2412A | 2414A | 2415A | 2417A |       |

Provide each door(s) with the following:

| QTY |    | DESCRIPTION      | CATALOG NUMBER              |  | FINISH | MFR |
|-----|----|------------------|-----------------------------|--|--------|-----|
| 3   | EA | HINGE            | 5BB1HW 4.5 X 4.5            |  | 652    | IVE |
| 1   | EA | CLASSRM SEC LOCK | 195 DB                      |  | 626    | MKS |
| 2   | EA | KIL CYLINDER     | 40-100 EV29 T135            |  | 626    | SCH |
| 1   | EA | SURFACE CLOSER   | 4040XP SCUSH MC             |  | 689    | LCN |
| 1   | EA | KICK PLATE       | 8400 10" X 2" LDW B-CS      |  | 630    | IVE |
| 1   | EA | GASKETING        | 188SBK PSA (HEADER & JAMBS) |  | BK     | ZER |

USE SPRING CUSH ARM TO STOP DOOR







Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 11

For use on Door #(s):

1122                    1123

Provide each door(s) with the following:

| QTY |    | DESCRIPTION                      | CATALOG NUMBER              |   | FINISH | MFR |
|-----|----|----------------------------------|-----------------------------|---|--------|-----|
| 3   | EA | HINGE                            | 5BB1HW 4.5 X 4.5            |  | 652    | IVE |
| 1   | EA | POWER TRANSFER                   | EPT10 CON                   |  | ↗ 689  | VON |
| 1   | EA | ELECTRIFIED LOCKSET              | EA195 FEU REX               |   | ↗ 626  | MKS |
| 1   | EA | KIL CYLINDER                     | 40-100 EV29 T135            |   | 626    | SCH |
| 1   | EA | SURFACE CLOSER                   | 4040XP MC                   |  | 689    | LCN |
| 1   | EA | KICK PLATE                       | 8400 10" X 2" LDW B-CS      |  | 630    | IVE |
| 1   | EA | WALL STOP                        | WS406/407CCV                |  | 630    | IVE |
| 1   | EA | GASKETING                        | 188SBK PSA (HEADER & JAMBS) |  | BK     | ZER |
| 1   | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED) |   | ↗      | SCH |
| 1   | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                      |   | ↗      | SCH |
| 1   | EA | CREDENTIAL READER                | BY DIVISION 28.             |   | ↗      |     |
| 1   | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE              |   | ↗      |     |

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED  
 PRESENTING VALID CREDENTIAL TEMPORARILY RELEASES LEVER FOR ENTRY  
 DOOR IS SECURED UPON LOSS OF POWER TO THE LOCK  
 FREE EGRESS AT ALL TIMES

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 12A

For use on Door #(s):

1302A            1306A            1308            1312            2102

Provide each door(s) with the following:

| QTY |    | DESCRIPTION                         | CATALOG NUMBER   |  | FINISH | MFR |
|-----|----|-------------------------------------|--|--|--------|-----|
| 3   | EA | HINGE                               | 5BB1HW 4.5 X 4.5   |  | 652    | IVE |
| 1   | EA | POWER TRANSFER                      | EPT10 CON  |  | ↗ 689  | VON |
| 1   | EA | DELAYED PANIC<br>HARDWARE           | CX98-L-M996-06-FSE-CON 24<br>VDC                         |  | ↗ 626  | VON |
| 1   | EA | MORTISE CYLINDER                    | 20-001 (CAM & RING AS REQ'D)<br>EV29 T135<br>(FOR ALARM) |  | 626    | SCH |
| 1   | EA | RIM CYLINDER                        | 20-022 EV29 T  |  | 626    | SCH |
| 1   | EA | SURFACE CLOSER                      | 4040XP SCUSH MC  |  | 689    | LCN |
| 1   | EA | KICK PLATE                          | 8400 10" X 2" LDW B-CS                                   |  | 630    | IVE |
| 1   | EA | GASKETING                           | 188SBK PSA (HEADER &<br>JAMBS)                           |  | BK     | ZER |
| 1   | EA | WIRE HARNESS (HINGE<br>TO HARDWARE) | CON-XX (LENGTH AS<br>REQUIRED)                           |  | ↗      | SCH |
| 1   | EA | POWER SUPPLY WIRE<br>HARNESS        | CON-6W   |  | ↗      | SCH |
| 2   | EA | CREDENTIAL READER                   | BY DIVISION 28.  |  | ↗      |     |
| 1   | EA | LOW VOLTAGE POWER                   | BY LOW VOLTAGE   |  | ↗      |     |

USE SPRING CUSH ARM TO STOP DOOR  
 HARDWARE IS FOR OUTSWING DOOR. VERIFY SWINGING DIRECTION OF DOOR #2102

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED  
 PRESENTING VALID CREDENTIAL TEMPORARILY RELEASES LEVER FOR ENTRY  
 PRESENTING VALID CREDENTIAL FROM ROOM SIDE TEMPORARILY DISABLES THE LOCAL  
 ALARM AND DELAYED EGRESS FOR IMMEDIATE EXIT  
 PUSHING ACTUATION BAR WITHOUT VALID CREDENTIAL SOUNDS ALARM, MANUALLY RESET  
 ALARM  
 DOOR IS SECURED AT INGRESS SIDE UPON LOSS OF POWER TO THE LEVER TRIM  
 DOOR IS FOR IMMEDIATE EGRESS UPON ACTIVATION OF EMERGENCY SYSTEM, OR LOSS OF  
 POWER TO THE DEVICE

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 13

For use on Door #(s):

1201

Provide each door(s) with the following:

| QTY |    | DESCRIPTION                      | CATALOG NUMBER              |  | FINISH | MFR |
|-----|----|----------------------------------|-----------------------------|--|--------|-----|
| 3   | EA | HINGE                            | 5BB1HW 5 X 4.5              |  | 652    | IVE |
| 1   | EA | POWER TRANSFER                   | EPT10 CON                   |  | ↗ 689  | VON |
| 1   | EA | ELEC PANIC HARDWARE              | QEL-98-L-4'-06-CON 24 VDC   |  | ↗ 626  | VON |
| 1   | EA | RIM CYLINDER                     | 20-022 EV29 T               |  | 626    | SCH |
| 1   | EA | SURFACE CLOSER                   | 4040XP EDA MC               |  | 689    | LCN |
| 1   | EA | KICK PLATE                       | 8400 10" X 2" LDW B-CS      |  | 630    | IVE |
| 1   | EA | WALL STOP                        | WS406/407CCV                |  | 630    | IVE |
| 1   | EA | GASKETING                        | 488SBK PSA                  |  | BK     | ZER |
| 1   | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED) |  | ↗      | SCH |
| 1   | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                      |  | ↗      | SCH |
| 1   | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE              |  | ↗      |     |

CONNECT ELECTRIFIED DEVICE TO EMERGENCY SYSTEM

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED

DOOR MAY BY PROGRAMMED TO REMAIN UNLOCKED ON A SCHEDULE THROUGH ACCESS CONTROL SYSTEM

DOOR IS CLOSED AND SECURED UPON ACTIVATION OF EMERGENCY SYSTEM

FREE EGRESS AT ALL TIMES

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 14

For use on Door #(s):

1200A            1200B            1200C

Provide each door(s) with the following:

| QTY |     | DESCRIPTION                         | CATALOG NUMBER                       |  | FINISH | MFR |
|-----|-----|-------------------------------------|--------------------------------------|--|--------|-----|
| 6   | EA  | HINGE                               | 5BB1HW 4.5 X 4.5                     |  | 652    | IVE |
| 2   | EA  | POWER TRANSFER                      | EPT10 CON                            |  | ✓ 689  | VON |
| 1   | EA  | ELEC FIRE EXIT<br>HARDWARE          | QEL-9849-L-F-06-LBLAFL-CON<br>24 VDC |  | ✓ 626  | VON |
| 1   | EA  | ELEC FIRE EXIT<br>HARDWARE          | QEL-9849-L-F-06-LBL-CON 24<br>VDC    |  | ✓ 626  | VON |
| 2   | EA  | RIM CYLINDER                        | 20-022 EV29 T                        |  | 626    | SCH |
| 2   | EA  | SURFACE CLOSER                      | 4040XP EDA MC                        |  | 689    | LCN |
| 2   | EA  | KICK PLATE                          | 8400 10" X 1" LDW B-CS               |  | 630    | IVE |
| 2   | EA  | 35# MAGNET                          | SEM7850 12V/24V/120V                 |  | ✓ 689  | LCN |
| 1   | EA  | GASKETING                           | 188SBK PSA (HEADER &<br>JAMBS)       |  | BK     | ZER |
| 2   | SET | MEETING STILE                       | 328AA-S                              |  | AA     | ZER |
| 2   | EA  | DOOR BOTTOM                         | 355AA-FLO                            |  | AA     | ZER |
| 2   | EA  | WIRE HARNESS (HINGE<br>TO HARDWARE) | CON-XX (LENGTH AS<br>REQUIRED)       |  | ✓      | SCH |
| 2   | EA  | POWER SUPPLY WIRE<br>HARNESS        | CON-6W                               |  | ✓      | SCH |
| 1   | EA  | LOW VOLTAGE POWER                   | BY LOW VOLTAGE                       |  | ✓      |     |

CONNECT MAGNETIC DOOR HOLDER TO FIRE ALARM SYSTEM  
 CONNECT ELECTRIFIED DEVICE TO EMERGENCY SYSTEM

OPERATION

DOOR IS NORMALLY LATCHED AND SECURED

DOOR MAY BE PROGRAMMED TO REMAIN UNLOCKED ON A SCHEDULE THROUGH ACCESS  
 CONTROL SYSTEM

DOOR MAY BE HELD OPEN WITH MAGNETIC DOOR HOLDER

DOOR IS LATCHED AND SECURED UPON ACTIVATION OF FIRE ALARM OR EMERGENCY  
 SYSTEM, OR LOSS OF POWER TO THE MEGNETIC DOOR HOLDER

FREE EGRESS AT ALL TIMES









Project: Ogden City Schools – Hillcrest Elementary (V4)  
Architect Job#: 22785

Hardware Group No. 15

For use on Door #(s):

2322

Provide each door(s) with the following:

| QTY |     | DESCRIPTION    | CATALOG NUMBER              |   | FINISH | MFR |
|-----|-----|----------------|-----------------------------|---|--------|-----|
| 6   | EA  | HINGE          | 5BB1HW 4.5 X 4.5            |  | 652    | IVE |
| 2   | EA  | PANIC HARDWARE | LD-9849-L-2SI-06-LBL        |  | 626    | VON |
| 4   | EA  | RIM CYLINDER   | 20-022 EV29 T               |  | 626    | SCH |
| 2   | EA  | SURFACE CLOSER | 4040XP SHCUSH MC            |  | 689    | LCN |
| 2   | EA  | KICK PLATE     | 8400 10" X 1" LDW B-CS      |  | 630    | IVE |
| 1   | EA  | GASKETING      | 188SBK PSA (HEADER & JAMBS) |  | BK     | ZER |
| 2   | SET | MEETING STILE  | 328AA-S                     |  | AA     | ZER |
| 2   | EA  | DOOR BOTTOM    | 355AA-FLO                   |  | AA     | ZER |




DOOR MAY BE HELD OPEN WITH CLOSER ARM

Hardware Group No. 16

For use on Door #(s):

1313A                    1313B

Provide each door(s) with the following:

| QTY |    | DESCRIPTION      | CATALOG NUMBER   |   | FINISH | MFR |
|-----|----|------------------|------------------|---|--------|-----|
| 3   | EA | HINGE            | 5BB1 4.5 X 4.5   |  | 652    | IVE |
| 1   | EA | CLASSRM SEC LOCK | 195 DB           |   | 626    | MKS |
| 2   | EA | KIL CYLINDER     | 40-100 EV29 T135 |   | 626    | SCH |
| 1   | EA | OH STOP          | 90S              |  | 630    | GLY |
| 3   | EA | SILENCER         | SR64             |  | GRY    | IVE |

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 17

For use on Door #(s):

1336B                    1426B

Provide each door(s) with the following:

| QTY |    | DESCRIPTION                      | CATALOG NUMBER              |  | FINISH | MFR |
|-----|----|----------------------------------|-----------------------------|--|--------|-----|
| 3   | EA | HINGE                            | 5BB1HW 4.5 X 4.5            |  | 652    | IVE |
| 1   | EA | POWER TRANSFER                   | EPT10 CON                   |  | ↗ 695  | VON |
| 1   | EA | ELECTRIFIED LOCKSET              | EA195 FEU REX               |  | ↗ 626  | MKS |
| 1   | EA | KIL CYLINDER                     | 40-100 EV29 T135            |  | 626    | SCH |
| 1   | EA | SURFACE CLOSER                   | 4040XP MC                   |  | 689    | LCN |
| 1   | EA | KICK PLATE                       | 8400 10" X 2" LDW B-CS      |  | 630    | IVE |
| 1   | EA | 35# MAGNET                       | SEM7850 12V/24V/120V        |  | ↗ 689  | LCN |
| 1   | EA | GASKETING                        | 188SBK PSA (HEADER & JAMBS) |  | BK     | ZER |
| 1   | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED) |  | ↗      | SCH |
| 1   | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                      |  | ↗      | SCH |
| 1   | EA | CREDENTIAL READER                | BY DIVISION 28.             |  | ↗      |     |
| 1   | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE              |  | ↗      |     |

CONNECT MAGNETIC DOOR HOLDER TO EMERGENCY SYSTEM  
 DOOR MAY BE HELD OPEN WITH MAGNETIC DOOR HOLDER

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED  
 DOOR MAY BE HELD OPEN WITH THE MAGNETIC DOOR HOLDER  
 PRESENTING VALID CREDENTIAL TEMPORARILY RELEASES LEVER FOR ENTRY WHEN DOOR IS LOCKED  
 DOOR IS SECURED UPON LOSS OF POWER TO THE MAGNETIC DOOR HOLDER  
 FREE EGRESS AT ALL TIMES OPERATION:











Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 18

For use on Door #(s):

1301            1330            1410A            2113            2310A            2410  
 2410A

Provide each door(s) with the following:

| QTY |    | DESCRIPTION                | CATALOG NUMBER                            |   | FINISH | MFR |
|-----|----|----------------------------|---|---|--------|-----|
| 3   | EA | HINGE                      | 5BB1HW 4.5 X 4.5                          |  | 652    | IVE |
| 1   | EA | FAC RESTRM /HOTEL<br>W/IND | L9486L 06A L583-363 L583-375              |  | 626    | SCH |
| 1   | EA | MORTISE CYLINDER           | 30-002 X L583-153 114 EV29<br>T135 36-083 |  | 626    | SCH |
| 1   | EA | SURFACE CLOSER             | 4040XP MC                                 |  | 689    | LCN |
| 1   | EA | KICK PLATE                 | 8400 10" X 2" LDW B-CS                    |  | 630    | IVE |
| 1   | EA | WALL STOP                  | WS406/407CCV                              |  | 630    | IVE |
| 1   | EA | GASKETING                  | 488SBK PSA                                |  | BK     | ZER |
| 1   | EA | COAT AND HAT HOOK          | 543                                       |  | 630    | IVE |






FACULTY RESTROOM  
 UNLOCK DOOR WITH MECHANICAL KEY

Hardware Group No. 19

For use on Door #(s):

1109            1220

Provide each door(s) with the following:

| QTY |    | DESCRIPTION      | CATALOG NUMBER         |   | FINISH | MFR |
|-----|----|------------------|------------------------|---|--------|-----|
| 3   | EA | HINGE            | 5BB1HW 4.5 X 4.5       |  | 652    | IVE |
| 1   | EA | PRIVACY LATCHSET | 195 L                  |   | 626    | MKS |
| 1   | EA | SURFACE CLOSER   | 4040XP MC              |  | 689    | LCN |
| 1   | EA | KICK PLATE       | 8400 10" X 2" LDW B-CS |  | 630    | IVE |
| 1   | EA | WALL STOP        | WS406/407CCV           |  | 630    | IVE |
| 1   | EA | GASKETING        | 488SBK PSA             |  | BK     | ZER |






Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 20

For use on Door #(s):

1303            1305            1310            1316            1318            1321  
 1323

Provide each door(s) with the following:








| QTY |    | DESCRIPTION      | CATALOG NUMBER         |   | FINISH | MFR |
|-----|----|------------------|------------------------|---|--------|-----|
| 3   | EA | HINGE            | 5BB1HW 4.5 X 4.5       |  | 652    | IVE |
| 1   | EA | CLASSRM SEC LOCK | 195 DB                 |   | 626    | MKS |
| 2   | EA | KIL CYLINDER     | 40-100 EV29 T135       |   | 626    | SCH |
| 1   | EA | SURFACE CLOSER   | 4040XP MC              |  | 689    | LCN |
| 1   | EA | KICK PLATE       | 8400 10" X 2" LDW B-CS |  | 630    | IVE |
| 1   | EA | WALL STOP        | WS406/407CCV           |  | 630    | IVE |
| 1   | EA | GASKETING        | 488SBK PSA             |  | BK     | ZER |

Hardware Group No. 21

For use on Door #(s):

1114            1115

Provide each door(s) with the following:




| QTY |    | DESCRIPTION        | CATALOG NUMBER                            |   | FINISH | MFR |
|-----|----|--------------------|---|---|--------|-----|
| 3   | EA | HINGE              | 5BB1HW 4.5 X 4.5                          |    | 652    | IVE |
| 1   | EA | PRIVACY W/DB & IND | L9496L 06A L583-363                       |   | 626    | SCH |
| 1   | EA | MORTISE CYLINDER   | 20-001 (CAM & RING AS REQ'D)<br>EV29 T135 |   | 626    | SCH |
| 1   | EA | SURFACE CLOSER     | 4040XP MC                                 |  | 689    | LCN |
| 1   | EA | KICK PLATE         | 8400 10" X 2" LDW B-CS                    |  | 630    | IVE |
| 1   | EA | WALL STOP          | WS406/407CCV                              |  | 630    | IVE |
| 1   | EA | GASKETING          | 488SBK PSA                                |  | BK     | ZER |
| 1   | EA | COAT AND HAT HOOK  | 543                                       |  | 630    | IVE |

Hardware Group No. 22

For use on Door #(s):

1120            1304A            1304B            1317A            1317B            1322A  
 1322B            1424            2302A            2302B            2306A            2306B  
 2313A            2313B            2316A            2316B            2402A            2402B  
 2406A            2406B            2413A            2413B            2416A            2416B

Provide each door(s) with the following:

| QTY |    | DESCRIPTION    | CATALOG NUMBER   |   | FINISH | MFR |
|-----|----|----------------|------------------|---|--------|-----|
| 3   | EA | HINGE          | 5BB1 4.5 X 4.5   |  | 652    | IVE |
| 1   | EA | CLASSROOM LOCK | 195 S            |   | 626    | MKS |
| 1   | EA | KIL CYLINDER   | 40-100 EV29 T135 |   | 626    | SCH |
| 1   | EA | OH STOP        | 90S              |  | 630    | GLY |
| 3   | EA | SILENCER       | SR64             |  | GRY    | IVE |




Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 23

For use on Door #(s):

|       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 1309  | 1314  | 1402A | 1402B | 1406A | 1406B |
| 1413A | 1413B | 1416A | 1416B | 2103  | 2323A |
| 2323C |       |       |       |       |       |

Provide each door(s) with the following:




| QTY |    | DESCRIPTION    | CATALOG NUMBER   |   | FINISH | MFR |
|-----|----|----------------|------------------|---|--------|-----|
| 3   | EA | HINGE          | 5BB1 4.5 X 4.5   |  | 652    | IVE |
| 1   | EA | CLASSROOM LOCK | 195 S            |   | 626    | MKS |
| 1   | EA | KIL CYLINDER   | 40-100 EV29 T135 |   | 626    | SCH |
| 1   | EA | OH STOP        | 90S J            |  | 630    | GLY |
| 3   | EA | SILENCER       | SR64             |  | GRY    | IVE |

Hardware Group No. 24

For use on Door #(s):

|      |      |
|------|------|
| 1111 | 2100 |
|------|------|

Provide each door(s) with the following:






| QTY |    | DESCRIPTION    | CATALOG NUMBER   |   | FINISH | MFR |
|-----|----|----------------|------------------|---|--------|-----|
| 3   | EA | HINGE          | 5BB1 4.5 X 4.5   |    | 652    | IVE |
| 1   | EA | CLASSROOM LOCK | 195 S            |   | 626    | MKS |
| 1   | EA | KIL CYLINDER   | 40-100 EV29 T135 |   | 626    | SCH |
| 1   | EA | WALL STOP      | WS406/407CCV     |  | 630    | IVE |
| 1   | EA | GASKETING      | 488SBK PSA       |  | BK     | ZER |

Hardware Group No. 25

For use on Door #(s):

|       |       |
|-------|-------|
| 1214A | 1214B |
|-------|-------|

Provide each door(s) with the following:

| QTY |    | DESCRIPTION    | CATALOG NUMBER         |   | FINISH | MFR |
|-----|----|----------------|------------------------|---|--------|-----|
| 3   | EA | HINGE          | 5BB1HW 4.5 X 4.5       |  | 652    | IVE |
| 1   | EA | CLASSROOM LOCK | 195 S                  |   | 626    | MKS |
| 1   | EA | KIL CYLINDER   | 40-100 EV29 T135       |   | 626    | SCH |
| 1   | EA | SURFACE CLOSER | 4040XP HEDA MC         |  | 689    | LCN |
| 1   | EA | KICK PLATE     | 8400 10" X 2" LDW B-CS |  | 630    | IVE |
| 1   | EA | WALL STOP      | WS406/407CCV           |  | 630    | IVE |
| 3   | EA | SILENCER       | SR64                   |  | GRY    | IVE |

INSTALL HARDWARE TO ALLOW DOOR SWING MAXIMUM 180 DEGREES  
 DOOR MAY BE HELD OPEN WITH CLOSER ARM

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 26

For use on Door #(s):

1204

Provide each door(s) with the following:

| QTY |    | DESCRIPTION                      | CATALOG NUMBER              |  | FINISH | MFR |
|-----|----|----------------------------------|-----------------------------|--|--------|-----|
| 3   | EA | HINGE                            | 5BB1 4.5 X 4.5              |  | 652    | IVE |
| 1   | EA | POWER TRANSFER                   | EPT10 CON                   |  | ↗ 689  | VON |
| 1   | EA | ELECTRIFIED LOCKSET              | EA195 FEU REX               |  | ↗ 626  | MKS |
| 1   | EA | KIL CYLINDER                     | 40-100 EV29 T135            |  | 626    | SCH |
| 1   | EA | WALL STOP                        | WS406/407CCV                |  | 630    | IVE |
| 3   | EA | SILENCER                         | SR64                        |  | GRY    | IVE |
| 1   | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED) |  | ↗      | SCH |
| 1   | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                      |  | ↗      | SCH |
| 1   | EA | CREDENTIAL READER                | BY DIVISION 28.             |  | ↗      |     |
| 1   | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE              |  | ↗      |     |

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED  
 PRESENTING VALID CREDENTIAL TEMPORARILY RELEASES LEVER FOR ENTRY  
 DOOR IS SECURED UPON LOSS OF POWER TO THE LOCK  
 FREE EGRESS AT ALL TIMES

Hardware Group No. 27

For use on Door #(s):

1203                      1215                      1218                      1219

Provide each door(s) with the following:

| QTY |    | DESCRIPTION    | CATALOG NUMBER         |  | FINISH | MFR |
|-----|----|----------------|------------------------|--|--------|-----|
| 3   | EA | HINGE          | 5BB1HW 4.5 X 4.5       |  | 652    | IVE |
| 1   | EA | CLASSROOM LOCK | 195 S                  |  | 626    | MKS |
| 1   | EA | KIL CYLINDER   | 40-100 EV29 T135       |  | 626    | SCH |
| 1   | EA | KICK PLATE     | 8400 10" X 2" LDW B-CS |  | 630    | IVE |
| 1   | EA | WALL STOP      | WS406/407CCV           |  | 630    | IVE |
| 3   | EA | SILENCER       | SR64                   |  | GRY    | IVE |





Project: Ogden City Schools – Hillcrest Elementary (V4)  
Architect Job#: 22785

Hardware Group No. 28

For use on Door #(s):

1206D

Provide each door(s) with the following:






| QTY |    | DESCRIPTION    | CATALOG NUMBER         |   | FINISH | MFR |
|-----|----|----------------|------------------------|---|--------|-----|
| 3   | EA | HINGE          | 5BB1HW 5 X 4.5         |  | 652    | IVE |
| 1   | EA | CLASSROOM LOCK | 195 S                  |   | 626    | MKS |
| 1   | EA | KIL CYLINDER   | 40-100 EV29 T135       |   | 626    | SCH |
| 1   | EA | KICK PLATE     | 8400 10" X 2" LDW B-CS |  | 630    | IVE |
| 1   | EA | WALL STOP      | WS406/407CCV           |  | 630    | IVE |
| 3   | EA | SILENCER       | SR64                   |  | GRY    | IVE |

Hardware Group No. 29

For use on Door #(s):

1213

Provide each door(s) with the following:






| QTY |    | DESCRIPTION    | CATALOG NUMBER         |   | FINISH | MFR |
|-----|----|----------------|------------------------|---|--------|-----|
| 3   | EA | HINGE          | 5BB1HW 5 X 4.5 NRP     |    | 652    | IVE |
| 1   | EA | CLASSROOM LOCK | 195 S                  |   | 626    | MKS |
| 1   | EA | KIL CYLINDER   | 40-100 EV29 T135       |   | 626    | SCH |
| 1   | EA | SURFACE CLOSER | 4040XP HEDA MC         |   | 689    | LCN |
| 1   | EA | KICK PLATE     | 8400 10" X 2" LDW B-CS |  | 630    | IVE |
| 1   | EA | WALL STOP      | WS406/407CCV           |  | 630    | IVE |
| 3   | EA | SILENCER       | SR64                   |  | GRY    | IVE |

Hardware Group No. 30

For use on Door #(s):

1210                      1334

Provide each door(s) with the following:

| QTY |    | DESCRIPTION       | CATALOG NUMBER         |   | FINISH | MFR |
|-----|----|-------------------|------------------------|---|--------|-----|
| 6   | EA | HINGE             | 5BB1HW 4.5 X 4.5       |  | 652    | IVE |
| 1   | EA | MANUAL FLUSH BOLT | FB458                  |  | 626    | IVE |
| 1   | EA | CLASSROOM LOCK    | 195 S                  |   | 626    | MKS |
| 1   | EA | KIL CYLINDER      | 40-100 EV29 T135       |   | 626    | SCH |
| 2   | EA | KICK PLATE        | 8400 10" X 1" LDW B-CS |  | 630    | IVE |
| 2   | EA | WALL STOP         | WS406/407CCV           |  | 630    | IVE |
| 2   | EA | SILENCER          | SR64                   |  | GRY    | IVE |




Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 31

For use on Door #(s):

|      |      |       |      |      |      |
|------|------|-------|------|------|------|
| 1103 | 1106 | 1108  | 1112 | 1113 | 1221 |
| 1223 | 1331 | 2105  | 2106 | 2107 | 2108 |
| 2109 | 2110 | 2111B |      |      |      |

Provide each door(s) with the following:





| QTY |    | DESCRIPTION     | CATALOG NUMBER   |   | FINISH | MFR |
|-----|----|-----------------|------------------|---|--------|-----|
| 3   | EA | HINGE           | 5BB1 4.5 X 4.5   |  | 652    | IVE |
| 1   | EA | OFF/ENT LOCKSET | 195 AB           |   | 626    | MKS |
| 1   | EA | KIL CYLINDER    | 40-100 EV29 T135 |   | 626    | SCH |
| 1   | EA | WALL STOP       | WS406/407CCV     |  | 630    | IVE |
| 1   | EA | GASKETING       | 488SBK PSA       |  | BK     | ZER |

Hardware Group No. 31A

For use on Door #(s):

|      |      |
|------|------|
| 1110 | 2112 |
|------|------|

Provide each door(s) with the following:

| QTY |    | DESCRIPTION | CATALOG NUMBER               |   | FINISH | MFR |
|-----|----|-------------|------------------------------|---|--------|-----|
| 3   | EA | HINGE       | 5BB1 4.5 X 4.5               |    | 652    | IVE |
| 1   | EA | PASSAGE SET | L9010 06ALLL (TIME OUT LOCK) |    | 626    | SCH |
| 1   | EA | WALL STOP   | WS406/407CVX                 |  | 630    | IVE |
| 1   | EA | GASKETING   | 488SBK PSA                   |  | BK     | ZER |





PROVIDE LOCK WITH NO TRIM ON THE INSIDE  
 WHEN THE LOCK IS IN A NATURAL POSITION THE LEVER WILL BE HORIZONTAL AND THE LATCH  
 WILL BE RETAINED INSIDE THE LOCK CASE  
 THE OUTSIDE LEVER, WHEN HELD UP, WILL PROJECT THE LATCH INTO THE STRIKE AND  
 PREVENT EXISTING FROM THE INTERIOR  
 AS SOON AS THE OUTSIDE LEVER IS RELEASED THE LATCH RETRACTS AND ALLOWS THE  
 DOOR TO BE PUSHED OPEN FROM THE INSIDE

Hardware Group No. 33

For use on Door #(s):

|      |      |      |      |      |      |
|------|------|------|------|------|------|
| 1332 | 1333 | 1421 | 1422 | 2321 | 2421 |
|------|------|------|------|------|------|

Provide each door(s) with the following:

| QTY |    | DESCRIPTION    | CATALOG NUMBER   |   | FINISH | MFR |
|-----|----|----------------|------------------|---|--------|-----|
| 3   | EA | HINGE          | 5BB1 4.5 X 4.5   |  | 652    | IVE |
| 1   | EA | STOREROOM LOCK | 195 F            |   | 626    | MKS |
| 1   | EA | KIL CYLINDER   | 40-100 EV29 T135 |   | 626    | SCH |
| 1   | EA | SURFACE CLOSER | 4040XP MC        |  | 689    | LCN |
| 1   | EA | WALL STOP      | WS406/407CCV     |  | 630    | IVE |
| 1   | EA | GASKETING      | 488SBK PSA       |  | BK     | ZER |




Project: Ogden City Schools – Hillcrest Elementary (V4)  
Architect Job#: 22785

Hardware Group No. 33A

For use on Door #(s):

2200A

Provide each door(s) with the following:




| QTY |    | DESCRIPTION    | CATALOG NUMBER   |   | FINISH | MFR |
|-----|----|----------------|------------------|---|--------|-----|
| 3   | EA | HINGE          | 5BB1HW 4.5 X 4.5 |  | 652    | IVE |
| 1   | EA | STOREROOM LOCK | 195 F            |   | 626    | MKS |
| 1   | EA | KIL CYLINDER   | 40-100 EV29 T135 |   | 626    | SCH |
| 1   | EA | SURFACE CLOSER | 4040XP SCUSH MC  |  | 689    | LCN |
| 1   | EA | GASKETING      | 488SBK PSA       |  | BK     | ZER |

Hardware Group No. 34

For use on Door #(s):

1107

Provide each door(s) with the following:




| QTY |    | DESCRIPTION    | CATALOG NUMBER   |  | FINISH | MFR |
|-----|----|----------------|------------------|--|--------|-----|
| 3   | EA | HINGE          | 5BB1 4.5 X 4.5   |   | 652    | IVE |
| 1   | EA | STOREROOM LOCK | 195 F            |  | 626    | MKS |
| 1   | EA | KIL CYLINDER   | 40-100 EV29 T135 |  | 626    | SCH |
| 1   | EA | WALL STOP      | WS406/407CCV     |   | 630    | IVE |
| 3   | EA | SILENCER       | SR64             |  | GRY    | IVE |

Hardware Group No. 34A

For use on Door #(s):

1427

Provide each door(s) with the following:

| QTY |    | DESCRIPTION    | CATALOG NUMBER   |   | FINISH | MFR |
|-----|----|----------------|------------------|---|--------|-----|
| 3   | EA | HINGE          | 5BB1 4.5 X 4.5   |  | 652    | IVE |
| 1   | EA | STOREROOM LOCK | 195 F            |   | 626    | MKS |
| 1   | EA | KIL CYLINDER   | 40-100 EV29 T135 |   | 626    | SCH |
| 1   | EA | OH STOP        | 90S              |  | 630    | GLY |
| 3   | EA | SILENCER       | SR64             |  | GRY    | IVE |








Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 35

For use on Door #(s):

2111A

Provide each door(s) with the following:





| QTY |    | DESCRIPTION             | CATALOG NUMBER      |   | FINISH | MFR |
|-----|----|-------------------------|---------------------|---|--------|-----|
| 6   | EA | HINGE                   | 5BB1HW 4.5 X 4.5    |  | 652    | IVE |
| 2   | EA | MANUAL FLUSH BOLT       | FB458               |  | 626    | IVE |
| 1   | EA | DUST PROOF STRIKE       | DP1 OR DP2 AS REQ'D |  | 626    | IVE |
| 1   | EA | STOREROOM LOCK          | 195 F               |   | 626    | MKS |
| 1   | EA | KIL CYLINDER            | 40-100 EV29 T135    |   | 626    | SCH |
| 1   | EA | OH STOP                 | 90S                 |  | 630    | GLY |
| 1   | EA | SURFACE CLOSER          | 4040XP SHCUSH MC    |  | 689    | LCN |
| 1   | EA | OVERLAPPING<br>ASTRAGAL | 43STST              |  | STST   | ZER |
| 2   | EA | SILENCER                | SR64                |  | GRY    | IVE |

Hardware Group No. 36A

For use on Door #(s):

2320                    2420

Provide each door(s) with the following:

| QTY |    | DESCRIPTION      | CATALOG NUMBER                 |   | FINISH | MFR |
|-----|----|------------------|--------------------------------|---|--------|-----|
| 4   | EA | HINGE            | 5BB1HW 5 X 4.5                 |  | 652    | IVE |
| 1   | EA | STOREROOM LOCK   | 195 F                          |   | 626    | MKS |
| 1   | EA | KIL CYLINDER     | 40-100 EV29 T135               |   | 626    | SCH |
| 1   | EA | OH STOP & HOLDER | 100F ADJ                       |  | 630    | GLY |
| 1   | EA | SURFACE CLOSER   | 4040XP MC                      |  | 689    | LCN |
| 1   | EA | GASKETING        | 188SBK PSA (HEADER &<br>JAMBS) |  | BK     | ZER |





DOOR MAY BE HELD OPEN WITH OVERHEAD STOP/HOLD OPEN  
 PROVIDE FOUR HINGES AT 48" WIDE DOOR  
 HARDWARE IS FOR 48" X 84" DOOR

Hardware Group No. 37

For use on Door #(s):

1116

Provide each door(s) with the following:

| QTY |    | DESCRIPTION    | CATALOG NUMBER   |   | FINISH | MFR |
|-----|----|----------------|------------------|---|--------|-----|
| 3   | EA | HINGE          | 5BB1HW 5 X 4.5   |  | 652    | IVE |
| 1   | EA | STOREROOM LOCK | 195 F            |   | 626    | MKS |
| 1   | EA | KIL CYLINDER   | 40-100 EV29 T135 |   | 626    | SCH |
| 1   | EA | SURFACE CLOSER | 4040XP MC        |  | 689    | LCN |
| 1   | EA | WALL STOP      | WS406/407CCV     |  | 630    | IVE |
| 1   | EA | GASKETING      | 488SBK PSA       |  | BK     | ZER |













Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 38

For use on Door #(s):

1222A

Provide each door(s) with the following:









| QTY |    | DESCRIPTION         | CATALOG NUMBER         |   | FINISH | MFR |
|-----|----|---------------------|------------------------|---|--------|-----|
| 6   | EA | HINGE               | 5BB1HW 4.5 X 4.5       |  | 652    | IVE |
| 1   | EA | CONST LATCHING BOLT | FB53                   |  | 630    | IVE |
| 1   | EA | STOREROOM LOCK      | 195 F                  |   | 626    | MKS |
| 1   | EA | KIL CYLINDER        | 40-100 EV29 T135       |   | 626    | SCH |
| 1   | EA | COORDINATOR         | COR X FL               |  | 628    | IVE |
| 2   | EA | MOUNTING BRACKET    | MB1 OR MB2 AS REQ'D    |  | 689    | IVE |
| 1   | EA | SURFACE CLOSER      | 4040XP EDA MC          |  | 689    | LCN |
| 1   | EA | SURFACE CLOSER      | 4040XP SCUSH MC        |  | 689    | LCN |
| 2   | EA | KICK PLATE          | 8400 10" X 1" LDW B-CS |  | 630    | IVE |
| 2   | EA | WALL STOP           | WS406/407CCV           |  | 630    | IVE |
| 1   | EA | GASKETING           | 488SBK PSA             |  | BK     | ZER |
| 1   | EA | MEETING STILE       | 44STST                 |  | STST   | ZER |

Hardware Group No. 39

For use on Door #(s):

2200

Provide each door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER      |   | FINISH | MFR |
|-----|----|---------------------|---------------------|---|--------|-----|
| 6   | EA | HINGE               | 5BB1HW 4.5 X 4.5    |  | 652    | IVE |
| 1   | EA | CONST LATCHING BOLT | FB51P               |  | 630    | IVE |
| 1   | EA | DUST PROOF STRIKE   | DP1 OR DP2 AS REQ'D |  | 626    | IVE |
| 1   | EA | STOREROOM LOCK      | 195 F               |   | 626    | MKS |
| 1   | EA | KIL CYLINDER        | 40-100 EV29 T135    |   | 626    | SCH |
| 1   | EA | COORDINATOR         | COR X FL            |  | 628    | IVE |
| 2   | EA | OH STOP             | 100S ADJ            |  | 630    | GLY |
| 2   | EA | SURFACE CLOSER      | 4040XP MC           |  | 689    | LCN |
| 1   | EA | GASKETING           | 488SBK PSA          |  | BK     | ZER |
| 1   | EA | MEETING STILE       | 44STST              |  | STST   | ZER |





Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 40

For use on Door #(s):

1410B            2310B            2410B

Provide each door(s) with the following:


| QTY |    | DESCRIPTION      | CATALOG NUMBER     |   | FINISH | MFR |
|-----|----|------------------|--------------------|---|--------|-----|
| 3   | EA | HINGE            | 5BB1 4.5 X 4.5     |  | 652    | IVE |
| 1   | EA | SGL CYL DEADBOLT | B660P6 X EV29 T135 |  | 626    | SCH |
| 1   | EA | OH STOP          | 90S                |  | 630    | GLY |
| 3   | EA | SILENCER         | SR64               |  | GRY    | IVE |

Hardware Group No. 41

For use on Door #(s):

1302B            1306B            1315B            1319B            1320B            1324B  
 1401B            1403B            1405B            1407B            1412B            1414B  
 1415B            1417B            2301B            2303B            2305B            2307B  
 2312B            2314B            2315B            2317B            2401B            2403B  
 2405B            2407B            2412B            2414B            2415B            2417B

Provide each door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                         |   | FINISH | MFR |
|-----|----|---------------------|--|---|--------|-----|
| 1   | EA | SLIDING DOOR SYSTEM | BI-PARTING SLIDE SYSTEM SECTION 083400 |  |        | ADS |
| 1   | EA | MORTISE CYL TURN    | 09-905 (CAM & RING AS REQ'D)           |   | 626    | SCH |
| 1   | EA | MORTISE CYLINDER    | 20-001 (CAM & RING AS REQ'D) EV29 T135 |   | 626    | SCH |
| 1   | EA | BALANCE HARWARE     | BY SLIDING DOOR MANUFACTURER           |   |        |     |

Hardware Group No. 42

For use on Door #(s):

1209            1211B            1222B

Provide each door(s) with the following:

| QTY |    | DESCRIPTION | CATALOG NUMBER                                  |  | FINISH | MFR |
|-----|----|-------------|---|--|--------|-----|
| 1   | EA | NOTE        | ALL HARDWARE BY ROLLUP DOOR SUPPLIER/CONTRACTOR |  |        |     |

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. A01

For use on Door #(s):

1100A            1100B            1100C            1118A            1400A            1400B  
 1400C

Provide each door(s) with the following:

| QTY |    | DESCRIPTION                | CATALOG NUMBER                       |   | FINISH | MFR |
|-----|----|----------------------------|--------------------------------------|---|--------|-----|
| 1   | EA | CONT. HINGE                | 027XY                                |  | 710    | IVE |
| 1   | EA | PANIC HARDWARE             | XP98-DT                              |  | 313    | VON |
| 1   | EA | OH STOP                    | 100S ADJ                             |  | 695    | GLY |
| 1   | EA | SURFACE CLOSER             | 4040XP EDAW/62G MC                   |  | 695    | LCN |
| 1   | EA | DROP PLATE AND ACCESSORIES | PROVIDE AS NECESSARY                 |   | 695    |     |
| 1   | EA | WEATHERSTRIPPING           | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |
| 1   | EA | DOOR SWEEP                 | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |
| 1   | EA | THRESHOLD                  | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |
| 1   | EA | DOOR POSITION SWITCH       | BY DIVISION 28.                      |  |        |     |

MAG HOLDER REQUIRMENT GOT REMOVED  
 HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. A02

For use on Door #(s):

1100D            1118C

Provide each door(s) with the following:

| QTY |    | DESCRIPTION                      | CATALOG NUMBER                       |  | FINISH | MFR |
|-----|----|----------------------------------|--------------------------------------|--|--------|-----|
| 1   | EA | CONT. HINGE                      | 027XY EPT                            |  | 710    | IVE |
| 1   | EA | POWER TRANSFER                   | EPT10 CON                            |  | ✓ 695  | VON |
| 1   | EA | ELEC PANIC HARDWARE              | LXRX-LC-QEL-XP98-NL-CON 24 VDC       |  | ✓ 313  | VON |
| 1   | EA | RIM CYLINDER                     | 20-022 EV29 T                        |  | 613    | SCH |
| 1   | EA | SURF. AUTO OPERATOR              | 4642 CS WMS 120 VAC                  |  | ✓ 695  | LCN |
| 1   | EA | WEATHER RING                     | 8310-801                             |  |        | LCN |
| 1   | EA | ACTUATOR, TOUCH                  | 8310-853T                            |  | ✓ 630  | LCN |
| 1   | EA | ACTUATOR, TOUCH                  | 8310-855                             |  | ✓ 630  | LCN |
| 1   | EA | WEATHERSTRIPPING                 | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 1   | EA | DOOR SWEEP                       | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 1   | EA | THRESHOLD                        | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 1   | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED)          |  | ✓      | SCH |
| 1   | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                               |  | ✓      | SCH |
| 1   | EA | CREDENTIAL READER                | BY DIVISION 28.                      |  | ✓      |     |
| 1   | EA | DOOR POSITION SWITCH             | BY DIVISION 28.                      |  | ✓      |     |
| 1   | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE                       |  | ✓      |     |

HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED  
 DOOR MAY BE PROGRAMMED TO REMAIN UNLOCKED ON A SCHEDULE THROUGH ACCESS CONTROL SYSTEM  
 PRESENTING VALID CREDENTIAL TEMPORALLY RETRACTS LATCHBOLT FOR ENTRY WHEN DOOR IS LOCKED  
 EXTERIOR ACTUATOR IS CONTROLLED THROUGH ACCESS CONTROL SYSTEM, INTERIOR IS ALWAYS ACTIVE  
 DOOR IS MONITORED THROUGH ACCESS CONTROL OR SECURITY SYSTEM  
 DOOR IS SECURED UPON LOSS OF POWER TO THE DEVICE  
 FREE EGRESS AT ALL TIMES

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. A04

For use on Door #(s):

1100F          1100G          1100H          1101C          1101D          1400E  
 1400F          1400G          1400H

Provide each door(s) with the following:

| QTY |    | DESCRIPTION                | CATALOG NUMBER                       |  | FINISH | MFR |
|-----|----|----------------------------|--------------------------------------|--|--------|-----|
| 1   | EA | CONT. HINGE                | 027XY                                |  | 628    | IVE |
| 1   | EA | DUMMY PUSH BAR             | 350-DT-990                           |  | 626    | VON |
| 1   | EA | OH STOP                    | 100S ADJ                             |  | 630    | GLY |
| 1   | EA | SURFACE CLOSER             | 4040XP EDAW/62G MC                   |  | 689    | LCN |
| 1   | EA | DROP PLATE AND ACCESSORIES | PROVIDE AS NECESSARY                 |  | 689    |     |
| 1   | EA | WEATHERSTRIPPING           | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 1   | EA | THRESHOLD                  | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |

MAG HOLDER REQUIREMENT GOT REMOVED  
 HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS

Hardware Group No. A04A

For use on Door #(s):

1101A          1101B          2101A          2101B          2101C          2101D

Provide each door(s) with the following:

| QTY |    | DESCRIPTION                | CATALOG NUMBER                       |  | FINISH | MFR |
|-----|----|----------------------------|--------------------------------------|--|--------|-----|
| 1   | EA | CONT. HINGE                | 027XY                                |  | 628    | IVE |
| 1   | EA | DUMMY PUSH BAR             | 350-DT-990                           |  | 626    | VON |
| 1   | EA | OH STOP                    | 100S ADJ                             |  | 630    | GLY |
| 1   | EA | SURFACE CLOSER             | 4040XP EDAW/62G MC                   |  | 689    | LCN |
| 1   | EA | DROP PLATE AND ACCESSORIES | PROVIDE AS NECESSARY                 |  | 689    |     |
| 1   | EA | 35# MAGNET                 | SEM7850 12V/24V/120V                 |  | 689    | LCN |
| 1   | EA | WEATHERSTRIPPING           | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 1   | EA | THRESHOLD                  | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |

HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS  
 DOOR MAY BE HELD OPEN WITH MAGNETIC DOOR HOLDER

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. A05

For use on Door #(s):

1100E

Provide each door(s) with the following:

| QTY |    | DESCRIPTION         | CATALOG NUMBER                       |  | FINISH | MFR |
|-----|----|---------------------|--------------------------------------|--|--------|-----|
| 1   | EA | CONT. HINGE         | 027XY                                |  | 628    | IVE |
| 1   | EA | DUMMY PUSH BAR      | 350-DT-990                           |  | 626    | VON |
| 1   | EA | SURF. AUTO OPERATOR | 4642 CS WMS 120 VAC                  |  | ↗ 689  | LCN |
| 1   | EA | ACTUATOR, TOUCH     | 8310-853T                            |  | ↗ 630  | LCN |
| 1   | EA | WEATHERSTRIPPING    | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 1   | EA | THRESHOLD           | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |

REFERENCE HARDWARE SET FOR EXTERIOR DOOR FOR DIRECTIONAL ACTUATOR AT VESTIBULE SIDE  
 HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS  
 VERIFY IF CARD READER IS REQUIRED AT #1100E, HARDWARE IS NOT FOR ACCESS CONTROL

OPERATION:  
 ACTUATOR IS CONTROLLED BY OPERATOR

Hardware Group No. A06

For use on Door #(s):

1326A                      1419A

Provide each door(s) with the following:

| QTY |    | DESCRIPTION                | CATALOG NUMBER                       |  | FINISH | MFR |
|-----|----|----------------------------|--------------------------------------|--|--------|-----|
| 2   | EA | CONT. HINGE                | 027XY                                |  | 710    | IVE |
| 1   | EA | REMOVABLE MULLION          | 4954 STAB                            |  | 695    | VON |
| 1   | EA | PANIC HARDWARE             | XP98-DT                              |  | 313    | VON |
| 1   | EA | PANIC HARDWARE             | XP98-NL                              |  | 313    | VON |
| 1   | EA | RIM CYLINDER               | 20-022 EV29 T                        |  | 613    | SCH |
| 2   | EA | OH STOP                    | 100S ADJ                             |  | 695    | GLY |
| 2   | EA | SURFACE CLOSER             | 4040XP EDAW/62G MC                   |  | 695    | LCN |
| 2   | EA | DROP PLATE AND ACCESSORIES | PROVIDE AS NECESSARY                 |  |        |     |
| 1   | EA | MULLION SEAL               | 8780NBK PSA                          |  | BK     | ZER |
| 1   | EA | WEATHERSTRIPPING           | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 2   | EA | DOOR SWEEP                 | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 1   | EA | THRESHOLD                  | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 2   | EA | DOOR POSITION SWITCH       | BY DIVISION 28.                      |  |        | ↗   |

HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. A06A

For use on Door #(s):

1335A

Provide each door(s) with the following:

| QTY |    | DESCRIPTION                      | CATALOG NUMBER                       |  | FINISH | MFR |
|-----|----|----------------------------------|--------------------------------------|--|--------|-----|
| 2   | EA | CONT. HINGE                      | 027XY EPT                            |  | 710    | IVE |
| 2   | EA | POWER TRANSFER                   | EPT10 CON                            |  | ↗ 695  | VON |
| 1   | EA | REMOVABLE MULLION                | 4954 STAB                            |  | 695    | VON |
| 1   | EA | ELEC PANIC HARDWARE              | RX-QEL-XP98-DT-CON 24 VDC            |  | ↗ 313  | VON |
| 1   | EA | ELEC PANIC HARDWARE              | RX-QEL-XP98-NL-CON 24 VDC            |  | ↗ 313  | VON |
| 1   | EA | RIM CYLINDER                     | 20-022 EV29 T                        |  | 613    | SCH |
| 2   | EA | OH STOP                          | 100S ADJ                             |  | 695    | GLY |
| 2   | EA | SURFACE CLOSER                   | 4040XP EDaw/62G MC                   |  | 695    | LCN |
| 2   | EA | DROP PLATE AND ACCESSORIES       | PROVIDE AS NECESSARY                 |  | 695    |     |
| 1   | EA | MULLION SEAL                     | 8780NBK PSA                          |  | BK     | ZER |
| 1   | EA | WEATHERSTRIPPING                 | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 2   | EA | DOOR SWEEP                       | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 1   | EA | THRESHOLD                        | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 2   | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED)          |  | ↗      | SCH |
| 2   | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                               |  | ↗      | SCH |
| 1   | EA | CREDENTIAL READER                | BY DIVISION 28.                      |  | ↗      |     |
| 2   | EA | DOOR POSITION SWITCH             | BY DIVISION 28.                      |  | ↗      |     |
| 1   | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE                       |  | ↗      |     |

HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED

DOOR MAY BE PROGRAMMED TO REMAIN UNLOCKED ON A SCHEDULE THROUGH ACCESS CONTROL SYSTEM

PRESENTING VALID CREDENTIAL TEMPORALLY RETRACTS LATCHBOLT FOR ENTRY WHEN DOOR IS LOCKED

DOOR IS MONITORED THROUGH ACCESS CONTROL OR SECURITY SYSTEM

DOOR IS SECURED UPON LOSS OF POWER TO THE DEVICE

FREE EGRESS AT ALL TIMES

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. A07

For use on Door #(s):

1326B            1419B

Provide each door(s) with the following:

| QTY |    | DESCRIPTION                      | CATALOG NUMBER                       |  | FINISH | MFR |
|-----|----|----------------------------------|--------------------------------------|--|--------|-----|
| 1   | EA | CONT. HINGE                      | 027XY EPT                            |  | 628    | IVE |
| 1   | EA | POWER TRANSFER                   | EPT10 CON                            |  | ↗ 689  | VON |
| 1   | EA | ELEC PANIC HARDWARE              | RX-QEL-XP98-NL-CON 24 VDC            |  | ↗ 626  | VON |
| 1   | EA | RIM CYLINDER                     | 20-022 EV29 T                        |  | 626    | SCH |
| 1   | EA | OH STOP                          | 100S ADJ                             |  | 630    | GLY |
| 1   | EA | SURFACE CLOSER                   | 4040XP EDAW/62G MC                   |  | 689    | LCN |
| 1   | EA | DROP PLATE AND ACCESSORIES       | PROVIDE AS NECESSARY                 |  | 689    |     |
| 1   | EA | WEATHERSTRIPPING                 | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 1   | EA | THRESHOLD                        | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 1   | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED)          |  | ↗      | SCH |
| 1   | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                               |  | ↗      | SCH |
| 1   | EA | CREDENTIAL READER                | BY DIVISION 28.                      |  | ↗      |     |
| 1   | EA | DOOR POSITION SWITCH             | BY DIVISION 28.                      |  | ↗      |     |
| 1   | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE                       |  | ↗      |     |

HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED  
 DOOR MAY BE PROGRAMMED TO REMAIN UNLOCKED ON A SCHEDULE THROUGH ACCESS CONTROL SYSTEM  
 PRESENTING VALID CREDENTIAL TEMPORALLY RETRACTS LATCHBOLT FOR ENTRY WHEN DOOR IS LOCKED  
 DOOR IS MONITORED THROUGH ACCESS CONTROL OR SECURITY SYSTEM  
 DOOR IS SECURED UPON LOSS OF POWER TO THE DEVICE  
 FREE EGRESS AT ALL TIMES









Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. A08

For use on Door #(s):

2326                    2419

Provide each door(s) with the following:

| QTY |    | DESCRIPTION                      | CATALOG NUMBER                       |   | FINISH | MFR |
|-----|----|----------------------------------|--------------------------------------|---|--------|-----|
| 1   | EA | CONT. HINGE                      | 027XY EPT                            |  | 628    | IVE |
| 1   | EA | POWER TRANSFER                   | EPT10 CON                            |  | ↗ 689  | VON |
| 1   | EA | ELEC PANIC HARDWARE              | LD-XP98-L-M996-06-FS-CON             |  | ↗ 626  | VON |
| 1   | EA | RIM CYLINDER                     | 20-022 EV29 T                        |  | 626    | SCH |
| 1   | EA | OH STOP                          | 100S ADJ                             |  | 630    | GLY |
| 1   | EA | SURFACE CLOSER                   | 4040XP EDAW/62G MC                   |  | 689    | LCN |
| 1   | EA | DROP PLATE AND ACCESSORIES       | PROVIDE AS NECESSARY                 |   | 689    |     |
| 1   | EA | WEATHERSTRIPPING                 | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |
| 1   | EA | THRESHOLD                        | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |
| 1   | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED)          |   | ↗      | SCH |
| 1   | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                               |   | ↗      | SCH |
| 1   | EA | CREDENTIAL READER                | BY DIVISION 28.                      |   | ↗      |     |
| 1   | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE                       |   | ↗      |     |

HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS  
 CONNECT FAIL SAFE TRIM TO EMERGENCY SYSTEM

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED

DOOR MAY BE PROGRAMMED TO REMAIN UNLOCKED ON A SCHEDULE THROUGH ACCESS CONTROL SYSTEM

PRESENTING VALID CREDENTIAL TEMPORALLY RETRACTS LATCHBOLT FOR ENTRY WHEN DOOR IS LOCKED

DOOR IS UNSECURED FOR STAIRWELL REENTRY UPON ACTIVATION OF EMERGENCY SYSTEM, OR LOSS OF POWER TO THE DEVICE

FREE EGRESS AT ALL TIMES





Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. A09

For use on Door #(s):

1102A

Provide each door(s) with the following:

| QTY |    | DESCRIPTION                      | CATALOG NUMBER                       |   | FINISH | MFR |
|-----|----|----------------------------------|--------------------------------------|---|--------|-----|
| 1   | EA | CONT. HINGE                      | 027XY EPT                            |  | 628    | IVE |
| 1   | EA | POWER TRANSFER                   | EPT10 CON                            |  | ↗ 689  | VON |
| 1   | EA | ELECTRIFIED LOCKSET              | EA195 FEU REX                        |   | ↗ 626  | MKS |
| 1   | EA | KIL CYLINDER                     | 40-100 EV29 T135                     |   | 626    | SCH |
| 1   | EA | OH STOP                          | 100S ADJ                             |  | 630    | GLY |
| 1   | EA | SURFACE CLOSER                   | 4040XP MC                            |  | 689    | LCN |
| 1   | EA | DROP PLATE AND ACCESSORIES       | PROVIDE AS NECESSARY                 |   | 689    |     |
| 1   | EA | WEATHERSTRIPPING                 | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |
| 1   | EA | THRESHOLD                        | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |
| 1   | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED)          |   | ↗      | SCH |
| 1   | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                               |   | ↗      | SCH |
| 1   | EA | CREDENTIAL READER                | BY DIVISION 28.                      |   | ↗      |     |
| 1   | EA | DOOR POSITION SWITCH             | BY DIVISION 28.                      |   | ↗      |     |
| 1   | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE                       |   | ↗      |     |

HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED  
 PRESENTING VALID CREDENTIAL TEMPORALLY RETRACTS LATCHBOLT FOR ENTRY WHEN  
 DOOR IS LOCKED  
 DOOR IS SECURED UPON LOSS OF POWER TO THE DEVICE  
 FREE EGRESS AT ALL TIMES

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. A10

For use on Door #(s):

1336A            1400D            1426

Provide each door(s) with the following:

| QTY |    | DESCRIPTION                      | CATALOG NUMBER                       |  | FINISH | MFR |
|-----|----|----------------------------------|--------------------------------------|--|--------|-----|
| 1   | EA | CONT. HINGE                      | 027XY EPT                            |  | 710    | IVE |
| 1   | EA | POWER TRANSFER                   | EPT10 CON                            |  | ↗ 695  | VON |
| 1   | EA | ELEC PANIC HARDWARE              | RX-QEL-XP98-NL-CON 24 VDC            |  | ↗ 313  | VON |
| 1   | EA | RIM CYLINDER                     | 20-022 EV29 T                        |  | 613    | SCH |
| 1   | EA | OH STOP                          | 100S ADJ                             |  | 695    | GLY |
| 1   | EA | SURFACE CLOSER                   | 4040XP EDAW/62G MC                   |  | 695    | LCN |
| 1   | EA | DROP PLATE AND ACCESSORIES       | PROVIDE AS NECESSARY                 |  | 695    |     |
| 1   | EA | WEATHERSTRIPPING                 | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 1   | EA | DOOR SWEEP                       | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 1   | EA | THRESHOLD                        | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 1   | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED)          |  | ↗      | SCH |
| 1   | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                               |  | ↗      | SCH |
| 1   | EA | CREDENTIAL READER                | BY DIVISION 28.                      |  | ↗      |     |
| 1   | EA | DOOR POSITION SWITCH             | BY DIVISION 28.                      |  | ↗      |     |
| 1   | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE                       |  | ↗      |     |

HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS  
 VERIFY IF CARD READER, ADA OPERATOR IS REQUIRED AT DOOR #1400D

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED  
 PRESENTING VALID CREDENTIAL TEMPORALLY RETRACTS LATCHBOLT FOR ENTRY  
 DOOR IS MONITORED THROUGH ACCESS CONTROL OR SECURITY SYSTEM  
 DOOR IS SECURED UPON LOSS OF POWER TO THE DEVICE  
 FREE EGRESS AT ALL TIMES

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. A11

For use on Door #(s):

1102B

Provide each door(s) with the following:

| QTY |    | DESCRIPTION                      | CATALOG NUMBER                       |  | FINISH | MFR |
|-----|----|----------------------------------|--------------------------------------|--|--------|-----|
| 1   | EA | CONT. HINGE                      | 027XY EPT                            |  | 628    | IVE |
| 1   | EA | POWER TRANSFER                   | EPT10 CON                            |  | ↗ 689  | VON |
| 1   | EA | ELECTRIFIED LOCKSET              | EA195 FEU REX                        |  | ↗ 626  | MKS |
| 1   | EA | KIL CYLINDER                     | 40-100 EV29 T135                     |  | 626    | SCH |
| 1   | EA | SURFACE CLOSER                   | 4040XP MC                            |  | 689    | LCN |
| 1   | EA | DROP PLATE AND ACCESSORIES       | PROVIDE AS NECESSARY                 |  | 689    |     |
| 1   | EA | WALL STOP                        | WS406/407CCV                         |  | 630    | IVE |
| 1   | EA | WEATHERSTRIPPING                 | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 1   | EA | THRESHOLD                        | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 1   | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED)          |  | ↗      | SCH |
| 1   | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                               |  | ↗      | SCH |
| 1   | EA | DOOR POSITION SWITCH             | BY DIVISION 28.                      |  | ↗      |     |
| 1   | EA | DURESS BUTTON                    | BY DIVISION 28.                      |  | ↗ 630  |     |
| 1   | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE                       |  | ↗      |     |

HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED

DOOR MAY BE PROGRAMMED TO REMAIN UNLOCKED ON A SCHEDULE THROUGH ACCESS CONTROL SYSTEM

PUSHING DURESS BUTTON LOCKS LEVER AT CORRIDOR SIDE DURING EMERGENCY

DOOR IS MONITORED THROUGH ACCESS CONTROL OR SECURITY SYSTEM

DOOR IS SECURED UPON LOSS OF POWER TO THE LOCK

FREE EGRESS AT ALL TIMES





Project: Ogden City Schools – Hillcrest Elementary (V4)  
Architect Job#: 22785

Hardware Group No. A12

For use on Door #(s):

1335B

Provide each door(s) with the following:

| QTY |    | DESCRIPTION                | CATALOG NUMBER                       |   | FINISH | MFR |
|-----|----|----------------------------|--------------------------------------|---|--------|-----|
| 2   | EA | CONT. HINGE                | 027XY                                |  | 628    | IVE |
| 2   | EA | DUMMY PUSH BAR             | 350-DT-990                           |  | 626    | VON |
| 2   | EA | OH STOP                    | 100S ADJ                             |  | 630    | GLY |
| 2   | EA | SURFACE CLOSER             | 4040XP EDAW/62G MC                   |  | 689    | LCN |
| 2   | EA | DROP PLATE AND ACCESSORIES | PROVIDE AS NECESSARY                 |   | 689    |     |
| 1   | EA | WEATHERSTRIPPING           | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |
| 1   | EA | THRESHOLD                  | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |

HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. A14

For use on Door #(s):

1118B

Provide each door(s) with the following:

| QTY |    | DESCRIPTION                      | CATALOG NUMBER                       |  | FINISH | MFR |
|-----|----|----------------------------------|--------------------------------------|--|--------|-----|
| 2   | EA | CONT. HINGE                      | 027XY EPT                            |  | 628    | IVE |
| 2   | EA | POWER TRANSFER                   | EPT10 CON                            |  | ✓ 689  | VON |
| 1   | EA | REMOVABLE MULLION                | 4954 STAB                            |  | 689    | VON |
| 1   | EA | ELEC PANIC HARDWARE              | LXRX-LC-QEL-XP98-NL-CON 24 VDC       |  | ✓ 626  | VON |
| 1   | EA | ELEC PANIC HARDWARE              | RX-QEL-XP98-EO-CON 24 VDC            |  | ✓ 626  | VON |
| 1   | EA | RIM CYLINDER                     | 20-022 EV29 T                        |  | 626    | SCH |
| 2   | EA | OH STOP                          | 100S ADJ                             |  | 630    | GLY |
| 1   | EA | SURFACE CLOSER                   | 4040XP ED AW/62G MC                  |  | 689    | LCN |
| 1   | EA | DROP PLATE AND ACCESSORIES       | PROVIDE AS NECESSARY                 |  | 689    |     |
| 1   | EA | SURF. AUTO OPERATOR              | 4642 CS WMS 120 VAC                  |  | ✓ 689  | LCN |
| 1   | EA | WEATHER RING                     | 8310-801                             |  |        | LCN |
| 2   | EA | ACTUATOR, TOUCH                  | 8310-853T                            |  | ✓ 630  | LCN |
| 1   | EA | MULLION SEAL                     | 8780NBK PSA                          |  | BK     | ZER |
| 1   | EA | WEATHERSTRIPPING                 | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 1   | EA | THRESHOLD                        | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 2   | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED)          |  | ✓      | SCH |
| 2   | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                               |  | ✓      | SCH |
| 1   | EA | CREDENTIAL READER                | BY DIVISION 28.                      |  | ✓      |     |
| 1   | EA | DOOR POSITION SWITCH             | BY DIVISION 28.                      |  | ✓      |     |
| 1   | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE                       |  | ✓      |     |

HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED

DOOR MAY BE PROGRAMMED TO REMAIN UNLOCKED ON A SCHEDULE THROUGH ACCESS CONTROL SYSTEM

PRESENTING VALID CREDENTIAL TEMPORALLY RETRACTS LATCHBOLT FOR ENTRY WHEN DOOR IS LOCKED

EXTERIOR ACTUATOR IS CONTROLLED THROUGH ACCESS CONTROL SYSTEM, INTERIOR IS ALWAYS ACTIVE

DOOR IS MONITORED THROUGH ACCESS CONTROL OR SECURITY SYSTEM

DOOR IS SECURED UPON LOSS OF POWER TO THE DEVICE

FREE EGRESS AT ALL TIMES




Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. A15

For use on Door #(s):

1104                  1307                  1325                  2318

Provide each door(s) with the following:




| QTY |    | DESCRIPTION                | CATALOG NUMBER                       |   | FINISH | MFR |
|-----|----|----------------------------|--------------------------------------|---|--------|-----|
| 1   | EA | CONT. HINGE                | 027XY                                |  | 628    | IVE |
| 1   | EA | CLASSRM SEC LOCK           | 195 DB                               |   | 626    | MKS |
| 2   | EA | KIL CYLINDER               | 40-100 EV29 T135                     |   | 626    | SCH |
| 1   | EA | SURFACE CLOSER             | 4040XP MC                            |  | 689    | LCN |
| 1   | EA | DROP PLATE AND ACCESSORIES | PROVIDE AS NECESSARY                 |   | 689    |     |
| 1   | EA | WALL STOP                  | WS406/407CCV                         |  | 630    | IVE |
| 1   | EA | WEATHERSTRIPPING           | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |

Hardware Group No. A16

For use on Door #(s):

1311                  1404                  1408                  1418                  2304                  2308  
 2404                  2408                  2418

Provide each door(s) with the following:

| QTY |    | DESCRIPTION                | CATALOG NUMBER                       |   | FINISH | MFR |
|-----|----|----------------------------|--------------------------------------|---|--------|-----|
| 1   | EA | CONT. HINGE                | 027XY                                |  | 628    | IVE |
| 1   | EA | CLASSRM SEC LOCK           | 195 DB                               |   | 626    | MKS |
| 2   | EA | KIL CYLINDER               | 40-100 EV29 T135                     |   | 626    | SCH |
| 1   | EA | OH STOP                    | 100S ADJ                             |  | 630    | GLY |
| 1   | EA | SURFACE CLOSER             | 4040XP MC                            |  | 689    | LCN |
| 1   | EA | DROP PLATE AND ACCESSORIES | PROVIDE AS NECESSARY                 |   | 689    |     |
| 1   | EA | WEATHERSTRIPPING           | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |

VERIFY DOOR/FRAME MATERIAL AT #1408, #1311, #2408, #2308





Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. A17

For use on Door #(s):

2104

Provide each door(s) with the following:

| QTY |    | DESCRIPTION                      | CATALOG NUMBER                       |   | FINISH | MFR |
|-----|----|----------------------------------|--------------------------------------|---|--------|-----|
| 1   | EA | CONT. HINGE                      | 027XY EPT                            |  | 628    | IVE |
| 1   | EA | POWER TRANSFER                   | EPT10 CON                            |  | ↗ 689  | VON |
| 1   | EA | ELECTRIFIED LOCKSET              | EA195 FEU REX                        |   | ↗ 626  | MKS |
| 1   | EA | KIL CYLINDER                     | 40-100 EV29 T135                     |   | 626    | SCH |
| 1   | EA | OH STOP                          | 100S ADJ                             |  | 630    | GLY |
| 1   | EA | SURFACE CLOSER                   | 4040XP EDAW/62G MC                   |  | 689    | LCN |
| 1   | EA | DROP PLATE AND ACCESSORIES       | PROVIDE AS NECESSARY                 |   | 689    |     |
| 1   | EA | WEATHERSTRIPPING                 | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |
| 1   | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED)          |   | ↗      | SCH |
| 1   | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                               |   | ↗      | SCH |
| 1   | EA | CREDENTIAL READER                | BY DIVISION 28.                      |   | ↗      |     |
| 1   | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE                       |   | ↗      |     |

VERIFY IF CARD READER IS REQUIRED AT #2104

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED

PRESENTING VALID CREDENTIAL TEMPORARILY RELEASES LEVER FOR ENTRY

DOOR IS SECURED UPON LOSS OF POWER TO THE LOCK

FREE EGRESS AT ALL TIMES

END OF SECTION



101950 OPT0325271

V3 11/17/2023 vs. V4 11/27/2023

Legend:

↗ Electrified Opening

| Door#  | HwSet# |
|--------|--------|
| 1100A↗ | A01    |
| 1100B↗ | A01    |
| 1100C↗ | A01    |
| 1100D↗ | A02    |
| 1100E↗ | A05    |
| 1100F  | A04    |
| 1100G  | A04    |
| 1100H  | A04    |
| 1101A↗ | A04A   |
| 1101B↗ | A04A   |
| 1101C  | A04    |
| 1101D  | A04    |
| 1102A↗ | A09    |
| 1102B↗ | A11    |
| 1103   | 31     |
| 1104   | A15    |
| 1105↗  | 09     |
| 1106   | 31     |
| 1107   | 34     |
| 1108   | 31     |
| 1109   | 19     |
| 1110   | 31A    |
| 1111   | 24     |
| 1112   | 31     |
| 1113   | 31     |
| 1114   | 21     |
| 1115   | 21     |
| 1116   | 37     |
| 1118A↗ | A01    |
| 1118B↗ | A14    |
| 1118C↗ | A02    |
| 1120   | 22     |
| 1122↗  | 11     |
| 1123↗  | 11     |
| 1200A↗ | 14     |
| 1200B↗ | 14     |
| 1200C↗ | 14     |
| 1201↗  | 13     |
| 1202B↗ | 08     |
| 1203   | 27     |
| 1204↗  | 26     |

| Door#  | HwSet# |
|--------|--------|
| 1206B  | 07     |
| 1206C  | 04     |
| 1206D  | 28     |
| 1207A↗ | 01     |
| 1207B↗ | 01     |
| 1208   | 03     |
| 1209   | 42     |
| 1210   | 30     |
| 1211B  | 42     |
| 1213   | 29     |
| 1214A  | 25     |
| 1214B  | 25     |
| 1215   | 27     |
| 1218   | 27     |
| 1219   | 27     |
| 1220   | 19     |
| 1221   | 31     |
| 1222A  | 38     |
| 1222B  | 42     |
| 1222C↗ | 05     |
| 1222D  | 06     |
| 1223   | 31     |
| 1301   | 18     |
| 1302A↗ | 12A    |
| 1302B  | 41     |
| 1303   | 20     |
| 1304A  | 22     |
| 1304B  | 22     |
| 1305   | 20     |
| 1306A↗ | 12A    |
| 1306B  | 41     |
| 1307   | A15    |
| 1308↗  | 12A    |
| 1309   | 23     |
| 1310   | 20     |
| 1311   | A16    |
| 1312↗  | 12A    |
| 1313A  | 16     |
| 1313B  | 16     |
| 1314   | 23     |
| 1315A  | 10     |

| Door#  | HwSet# |
|--------|--------|
| 1315B  | 41     |
| 1316   | 20     |
| 1317A  | 22     |
| 1317B  | 22     |
| 1318   | 20     |
| 1319A  | 10     |
| 1319B  | 41     |
| 1320A  | 10     |
| 1320B  | 41     |
| 1321   | 20     |
| 1322A  | 22     |
| 1322B  | 22     |
| 1323   | 20     |
| 1324A  | 10     |
| 1324B  | 41     |
| 1325   | A15    |
| 1326A↗ | A06    |
| 1326B↗ | A07    |
| 1327↗  | 02     |
| 1330   | 18     |
| 1331   | 31     |
| 1332   | 33     |
| 1333   | 33     |
| 1334   | 30     |
| 1335A↗ | A06A   |
| 1335B  | A12    |
| 1336A↗ | A10    |
| 1336B↗ | 17     |
| 1400A↗ | A01    |
| 1400B↗ | A01    |
| 1400C↗ | A01    |
| 1400D↗ | A10    |
| 1400E  | A04    |
| 1400F  | A04    |
| 1400G  | A04    |
| 1400H  | A04    |
| 1401A  | 10     |
| 1401B  | 41     |
| 1402A  | 23     |
| 1402B  | 23     |
| 1403A  | 10     |

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

| Door#  | HwSet# |
|--------|--------|
| 1403B  | 41     |
| 1404   | A16    |
| 1405A  | 10     |
| 1405B  | 41     |
| 1406A  | 23     |
| 1406B  | 23     |
| 1407A  | 10     |
| 1407B  | 41     |
| 1408   | A16    |
| 1410A  | 18     |
| 1410B  | 40     |
| 1412A  | 10     |
| 1412B  | 41     |
| 1413A  | 23     |
| 1413B  | 23     |
| 1414A  | 10     |
| 1414B  | 41     |
| 1415A  | 10     |
| 1415B  | 41     |
| 1416A  | 23     |
| 1416B  | 23     |
| 1417A  | 10     |
| 1417B  | 41     |
| 1418   | A16    |
| 1419A✓ | A06    |
| 1419B✓ | A07    |
| 1420✓  | 02     |
| 1421   | 33     |
| 1422   | 33     |
| 1424   | 22     |
| 1426✓  | A10    |
| 1426B✓ | 17     |
| 1427   | 34A    |
| 2100   | 24     |
| 2101A✓ | A04A   |
| 2101B✓ | A04A   |
| 2101C✓ | A04A   |
| 2101D✓ | A04A   |
| 2102✓  | 12A    |
| 2103   | 23     |
| 2104✓  | A17    |
| 2105   | 31     |
| 2106   | 31     |
| 2107   | 31     |
| 2108   | 31     |
| 2109   | 31     |

| Door#        | HwSet#     |
|--------------|------------|
| 2110         | 31         |
| 2111A        | 35         |
| 2111B        | 31         |
| 2112         | 31A        |
| 2113         | 18         |
| 2200         | 39         |
| <u>2200A</u> | <u>33A</u> |
| 2301A        | 10         |
| 2301B        | 41         |
| 2302A        | 22         |
| 2302B        | 22         |
| 2303A        | 10         |
| 2303B        | 41         |
| 2304         | A16        |
| 2305A        | 10         |
| 2305B        | 41         |
| 2306A        | 22         |
| 2306B        | 22         |
| 2307A        | 10         |
| 2307B        | 41         |
| 2308         | A16        |
| 2310A        | 18         |
| 2310B        | 40         |
| 2312A        | 10         |
| 2312B        | 41         |
| 2313A        | 22         |
| 2313B        | 22         |
| 2314A        | 10         |
| 2314B        | 41         |
| 2315A        | 10         |
| 2315B        | 41         |
| 2316A        | 22         |
| 2316B        | 22         |
| 2317A        | 10         |
| 2317B        | 41         |
| 2318         | A15        |
| 2320         | 36A        |
| 2321         | 33         |
| 2322         | 15         |
| 2323A        | 23         |
| 2323B        | 10         |
| 2323C        | 23         |
| 2326✓        | A08        |
| 2401A        | 10         |
| 2401B        | 41         |
| 2402A        | 22         |

| Door# | HwSet# |
|-------|--------|
| 2402B | 22     |
| 2403A | 10     |
| 2403B | 41     |
| 2404  | A16    |
| 2405A | 10     |
| 2405B | 41     |
| 2406A | 22     |
| 2406B | 22     |
| 2407A | 10     |
| 2407B | 41     |
| 2408  | A16    |
| 2410  | 18     |
| 2410A | 18     |
| 2410B | 40     |
| 2412A | 10     |
| 2412B | 41     |
| 2413A | 22     |
| 2413B | 22     |
| 2414A | 10     |
| 2414B | 41     |
| 2415A | 10     |
| 2415B | 41     |
| 2416A | 22     |
| 2416B | 22     |
| 2417A | 10     |
| 2417B | 41     |
| 2418  | A16    |
| 2419✓ | A08    |
| 2420  | 36A    |
| 2421  | 33     |

Project: Ogden City Schools – Hillcrest Elementary (V4)  
Architect Job#: 22785

101950 OPT0325271

V3 11/17/2023 vs. V4 11/27/2023

Legend:










-  Link to catalog cut sheet
-  Electrified Opening

Hardware Group No. 01

For use on Door #(s):

1207A            1207B

Provide each SGL door(s) with the following:

| QT |     | DESCRIPTION          | CATALOG NUMBER             |   | FINISH | MFR   |
|----|-----|----------------------|----------------------------|---|--------|---|
| Y  |     |                      |                            |   |        |   |
| 3  | EA  | HINGE                | 5BB1HW 4.5 X 4.5 NRP       |  | 630    | IVE   |
| 1  | EA  | PANIC HARDWARE       | LD-XP98-NL                 |  | 626    | VON   |
| 1  | EA  | RIM CYLINDER         | 20-022 EV29 T              |  | 626    | SCH   |
| 1  | EA  | SURFACE CLOSER       | 4040XP SCUSH MC            |  | 689    | LCN   |
| 1  | EA  | RAIN DRIP            | 142AA (AS REQ'D)           |  | AA     | ZER   |
| 1  | SET | GASKETING            | 429 @ HEAD & JAMBS         |  | AA     | ZER   |
| 1  | EA  | DOOR SWEEP           | 39A                        |  | A      | ZER   |
| 1  | EA  | THRESHOLD            | 655A - OR PER SILL DETAILS |  | A      | ZER   |
| 1  | EA  | DOOR POSITION SWITCH | BY DIVISION 28.            |   |        |  |









Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 02

For use on Door #(s):

1327                    1420

Provide each SGL door(s) with the following:

| QT |     | DESCRIPTION          | CATALOG NUMBER             |   | FINISH | MFR |
|----|-----|----------------------|----------------------------|---|--------|-----|
| Y  |     |                      |                            |   |        |     |
| 3  | EA  | HINGE                | 5BB1HW 4.5 X 4.5 NRP       |  | 630    | IVE |
| 1  | EA  | STOREROOM LOCK       | 195 F                      |   | 626    | MKS |
| 1  | EA  | KIL CYLINDER         | 40-100 EV29 T135           |   | 626    | SCH |
| 1  | EA  | LOCK GUARD           | LG12                       |  | 630    | IVE |
| 1  | EA  | SURFACE CLOSER       | 4040XP EDA MC              |  | 689    | LCN |
| 1  | EA  | FLOOR STOP           | FS18S                      |  | BLK    | IVE |
| 1  | EA  | RAIN DRIP            | 142AA (AS REQ'D)           |  | AA     | ZER |
| 1  | SET | GASKETING            | 429 @ HEAD & JAMBS         |  | AA     | ZER |
| 1  | EA  | DOOR SWEEP           | 39A                        |  | A      | ZER |
| 1  | EA  | THRESHOLD            | 655A - OR PER SILL DETAILS |  | A      | ZER |
| 1  | EA  | DOOR POSITION SWITCH | BY DIVISION 28.            |   |        |     |









Hardware Group No. 03

For use on Door #(s):

1208

Provide each SGL door(s) with the following:







| QT |     | DESCRIPTION    | CATALOG NUMBER             |   | FINISH | MFR |
|----|-----|----------------|----------------------------|---|--------|-----|
| Y  |     |                |                            |   |        |     |
| 3  | EA  | HINGE          | 5BB1HW 4.5 X 4.5 NRP       |  | 630    | IVE |
| 1  | EA  | STOREROOM LOCK | 195 F                      |   | 626    | MKS |
| 1  | EA  | KIL CYLINDER   | 40-100 EV29 T135           |   | 626    | SCH |
| 1  | EA  | SURFACE CLOSER | 4040XP SCUSH MC            |  | 689    | LCN |
| 1  | EA  | RAIN DRIP      | 142AA (AS REQ'D)           |  | AA     | ZER |
| 1  | SET | GASKETING      | 429 @ HEAD & JAMBS         |  | AA     | ZER |
| 1  | EA  | DOOR SWEEP     | 39A                        |  | A      | ZER |
| 1  | EA  | THRESHOLD      | 655A - OR PER SILL DETAILS |  | A      | ZER |

Project: Ogden City Schools – Hillcrest Elementary (V4)  
Architect Job#: 22785

Hardware Group No. 04

For use on Door #(s):  
1206C

Provide each SGL door(s) with the following:









| QT |    | DESCRIPTION    | CATALOG NUMBER             |   | FINISH | MFR |
|----|----|----------------|----------------------------|---|--------|-----|
| Y  |    |                |                            |   |        |     |
| 3  | EA | HINGE          | 5BB1HW 4.5 X 4.5 NRP       |  | 630    | IVE |
| 1  | EA | STOREROOM LOCK | 195 F                      |   | 626    | MKS |
| 1  | EA | KIL CYLINDER   | 40-100 EV29 T135           |   | 626    | SCH |
| 1  | EA | LOCK GUARD     | LG12                       |  | 630    | IVE |
| 1  | EA | SURFACE CLOSER | 4040XP SCUSH MCSRI         |  | 689    | LCN |
| 1  | EA | DOOR SWEEP     | 39A                        |  | A      | ZER |
| 1  | EA | THRESHOLD      | 655A - OR PER SILL DETAILS |  | A      | ZER |
| 3  | EA | SILENCER       | SR64                       |  | GRY    | IVE |

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 05

For use on Door #(s):  
 1222C

Provide each SGL door(s) with the following:

| QT |     | DESCRIPTION                      | CATALOG NUMBER              |   | FINISH | MFR |
|----|-----|----------------------------------|-----------------------------|---|--------|-----|
| Y  |     |                                  |                             |   |        |     |
| 3  | EA  | HINGE                            | 5BB1HW 4.5 X 4.5 NRP        |  | 630    | IVE |
| 1  | EA  | POWER TRANSFER                   | EPT10 CON                   |  | ✓ 689  | VON |
| 1  | EA  | ELECTRIFIED LOCKSET              | EA195 FEU REX               |   | ✓ 626  | MKS |
| 1  | EA  | KIL CYLINDER                     | 40-100 EV29 T135            |   | 626    | SCH |
| 1  | EA  | LOCK GUARD                       | LG12                        |  | 630    | IVE |
| 1  | EA  | SURFACE CLOSER                   | 4040XP SCUSH MC             |  | 689    | LCN |
| 1  | EA  | RAIN DRIP                        | 142AA (AS REQ'D)            |  | AA     | ZER |
| 1  | SET | GASKETING                        | 429 @ HEAD & JAMBS          |  | AA     | ZER |
| 1  | EA  | DOOR SWEEP                       | 39A                         |  | A      | ZER |
| 1  | EA  | THRESHOLD                        | 655A - OR PER SILL DETAILS  |  | A      | ZER |
| 1  | EA  | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED) |   | ✓      | SCH |
| 1  | EA  | POWER SUPPLY WIRE HARNESS        | CON-6W                      |   | ✓      | SCH |
| 1  | EA  | CREDENTIAL READER                | BY DIVISION 28.             |   | ✓      |     |
| 1  | EA  | DOOR POSITION SWITCH             | BY DIVISION 28.             |   | ✓      |     |
| 1  | EA  | LOW VOLTAGE POWER                | BY LOW VOLTAGE              |   | ✓      |     |

OPERATION:








DOOR IS NORMALLY LATCHED AND SECURED  
 PRESENTING VALID CREDENTIAL TEMPORALLY RELEASES LEVER FOR ENTRY  
 DOOR IS MONITORED THROUGH ACCESS CONTROL OR SECURITY SYSTEM  
 DOOR IS SECURED UPON LOSS OF POWER TO THE LOCK  
 FREE EGRESS AT ALL TIMES

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 06

For use on Door #(s):  
 1222D

Provide each SGL door(s) with the following:

| QT<br>Y |     | DESCRIPTION    | CATALOG NUMBER             |   | FINISH | MFR |
|---------|-----|----------------|----------------------------|---|--------|-----|
| 3       | EA  | HINGE          | 5BB1HW 5 X 4.5 NRP         |  | 630    | IVE |
| 1       | EA  | STOREROOM LOCK | 195 F                      |   | 626    | MKS |
| 1       | EA  | KIL CYLINDER   | 40-100 EV29 T135           |   | 626    | SCH |
| 1       | EA  | SURFACE CLOSER | 4040XP SHCUSH MC           |  | 689    | LCN |
| 1       | EA  | KICK PLATE     | 8400 10" X 2" LDW B-CS     |  | 630    | IVE |
| 1       | EA  | RAIN DRIP      | 142AA (AS REQ'D)           |  | AA     | ZER |
| 1       | SET | GASKETING      | 429 @ HEAD & JAMBS         |  | AA     | ZER |
| 1       | EA  | DOOR SWEEP     | 39A                        |  | A      | ZER |
| 1       | EA  | THRESHOLD      | 655A - OR PER SILL DETAILS |  | A      | ZER |










DOOR MAY BE HELD OPEN WITH CLOSER ARM

I

Hardware Group No. 07

For use on Door #(s):  
 1206B

Provide each PR door(s) with the following:







| QT<br>Y |    | DESCRIPTION             | CATALOG NUMBER             |   | FINISH | MFR |
|---------|----|-------------------------|----------------------------|---|--------|-----|
| 6       | EA | HINGE                   | 5BB1HW 4.5 X 4.5 NRP       |  | 630    | IVE |
| 2       | EA | MANUAL FLUSH BOLT       | FB458                      |  | 626    | IVE |
| 1       | EA | DUST PROOF STRIKE       | DP1 OR DP2 AS REQ'D        |  | 626    | IVE |
| 2       | EA | OH STOP                 | 90S                        |  | 630    | GLY |
| 1       | EA | SURFACE CLOSER          | 4040XP SCUSH MCSRI         |  | 689    | LCN |
| 2       | EA | DOOR SWEEP              | 39A                        |  | A      | ZER |
| 1       | EA | OVERLAPPING<br>ASTRAGAL | 43STST                     |  | STST   | ZER |
| 1       | EA | THRESHOLD               | 655A - OR PER SILL DETAILS |  | A      | ZER |
| 2       | EA | SILENCER                | SR64                       |  | GRY    | IVE |

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 08

For use on Door #(s):  
 1202B

Provide each SGL door(s) with the following:

| QT |     | DESCRIPTION          | CATALOG NUMBER             |   | FINISH | MFR |
|----|-----|----------------------|----------------------------|---|--------|-----|
| Y  |     |                      |                            |   |        |     |
| 3  | EA  | HINGE                | 5BB1HW 4.5 X 4.5 NRP       |  | 630    | IVE |
| 1  | EA  | PANIC HARDWARE       | LD-XP98-EO-EMERG EXIT RSS  |  | 626    | VON |
| 1  | EA  | SURFACE CLOSER       | 4040XP SCUSH MC            |  | 689    | LCN |
| 1  | SET | GASKETING            | 429 @ HEAD & JAMBS         |  | AA     | ZER |
| 1  | EA  | DOOR SWEEP           | 39A                        |  | A      | ZER |
| 1  | EA  | THRESHOLD            | 655A - OR PER SILL DETAILS |  | A      | ZER |
| 1  | EA  | DOOR POSITION SWITCH | BY DIVISION 28.            |   | ↗      |     |
| 1  | EA  | EXTERNAL ALARM       | BY DIVISION 28.            |   | ↗      |     |








CONNECT DOOR POSITION SWITCH TO ALARM SYSTEM

OPERATION:  
 EMERGENCY EXIT ONLY  
 OPENING DOOR SOUNDS EXTERNAL ALARM

Hardware Group No. 09

For use on Door #(s):  
 1105

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION                      | CATALOG NUMBER              |   | FINISH | MFR |
|----|----|----------------------------------|-----------------------------|---|--------|-----|
| Y  |    |                                  |                             |   |        |     |
| 3  | EA | HINGE                            | 5BB1HW 4.5 X 4.5            |  | 652    | IVE |
| 1  | EA | POWER TRANSFER                   | EPT10 CON                   |  | ↗ 689  | VON |
| 1  | EA | ELEC PANIC HARDWARE              | LD-98-L-M996-06-FSE-CON     |  | ↗ 626  | VON |
| 1  | EA | RIM CYLINDER                     | 20-022 EV29 T               |  | 626    | SCH |
| 1  | EA | SURFACE CLOSER                   | 4040XP SCUSH MC             |  | 689    | LCN |
| 1  | EA | KICK PLATE                       | 8400 10" X 2" LDW B-CS      |  | 630    | IVE |
| 1  | EA | GASKETING                        | 488SBK PSA                  |  | BK     | ZER |
| 1  | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED) |   | ↗      | SCH |
| 1  | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                      |   | ↗      | SCH |
| 1  | EA | CREDENTIAL READER                | BY DIVISION 28.             |   | ↗      |     |
| 1  | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE              |   | ↗      |     |

USE SPRING CUSH ARM TO STOP DOOR

OPERATION:  
 DOOR IS NORMALLY LATCHED AND SECURED  
 PRESENTING VALID CREDENTIAL TEMPORARILY RELEASES LEVER FOR ENTRY  
 DOOR IS SECURED UPON LOSS OF POWER TO THE TRIM  
 FREE EGRESS AT ALL TIMES







Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 10

For use on Door #(s):

|       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 1315A | 1319A | 1320A | 1324A | 1401A | 1403A |
| 1405A | 1407A | 1412A | 1414A | 1415A | 1417A |
| 2301A | 2303A | 2305A | 2307A | 2312A | 2314A |
| 2315A | 2317A | 2323B | 2401A | 2403A | 2405A |
| 2407A | 2412A | 2414A | 2415A | 2417A |       |

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION      | CATALOG NUMBER                                       |   | FINISH | MFR |
|----|----|------------------|--|---|--------|-----|
| Y  |    |                  |  |   |        |     |
| 3  | EA | HINGE            | 5BB1HW 4.5 X 4.5                                     |  | 652    | IVE |
| 1  | EA | CLASSRM SEC LOCK | 195 DB   |   | 626    | MKS |
| 2  | EA | KIL CYLINDER     | 40-100 EV29 T135                                     |   | 626    | SCH |
| 1  | EA | SURFACE CLOSER   | <del>4040XP</del> <b>SCUSH MC</b> <del>(4040XP</del> |  | 689    | LCN |
|    |    |                  | <b>SCUSH)</b>  |   |        |     |
| 1  | EA | KICK PLATE       | 8400 10" X 2" LDW B-CS                               |  | 630    | IVE |
| 1  | EA | GASKETING        | 188SBK PSA (HEADER & JAMBS)                          |  | BK     | ZER |

USE SPRING CUSH ARM TO STOP DOOR







Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 11 SEC CLASSROOM OUTSWING CL OH STOP

For use on Door #(s):

1122                    1123

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION                      | CATALOG NUMBER              |   | FINISH | MFR |
|----|----|----------------------------------|-----------------------------|---|--------|-----|
| Y  |    |                                  |                             |   |        |     |
| 3  | EA | HINGE                            | 5BB1HW 4.5 X 4.5            |  | 652    | IVE |
| 1  | EA | POWER TRANSFER                   | EPT10 CON                   |  | ✓ 689  | VON |
| 1  | EA | ELECTRIFIED LOCKSET              | EA195 FEU REX               |   | ✓ 626  | MKS |
| 1  | EA | KIL CYLINDER                     | 40-100 EV29 T135            |   | 626    | SCH |
| 1  | EA | SURFACE CLOSER                   | 4040XP MC                   |  | 689    | LCN |
| 1  | EA | KICK PLATE                       | 8400 10" X 2" LDW B-CS      |  | 630    | IVE |
| 1  | EA | WALL STOP                        | WS406/407CCV                |  | 630    | IVE |
| 1  | EA | GASKETING                        | 188SBK PSA (HEADER & JAMBS) |  | BK     | ZER |
| 1  | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED) |   | ✓      | SCH |
| 1  | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                      |   | ✓      | SCH |
| 1  | EA | CREDENTIAL READER                | BY DIVISION 28.             |   | ✓      |     |
| 1  | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE              |   | ✓      |     |

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED  
 PRESENTING VALID CREDENTIAL TEMPORARILY RELEASES LEVER FOR ENTRY  
 DOOR IS SECURED UPON LOSS OF POWER TO THE LOCK  
 FREE EGRESS AT ALL TIMES

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 12A

For use on Door #(s):

1302A                  1306A                  1308                  1312                  2102

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION                         | CATALOG NUMBER  |  | FINISH | MFR |
|----|----|-------------------------------------|---|--|--------|-----|
| Y  |    |                                     |   |  |        |     |
| 3  | EA | HINGE                               | 5BB1HW 4.5 X 4.5  |  | 652    | IVE |
| 1  | EA | POWER TRANSFER                      | EPT10 CON   |  | ↗ 689  | VON |
| 1  | EA | DELAYED PANIC<br>HARDWARE           | CX98-L-M996-06-FSE-CON 24<br>VDC                                      |  | ↗ 626  | VON |
| 1  | EA | MORTISE CYLINDER                    | 20-001 (CAM & RING AS<br>REQ'D) EV29 T135<br>(FOR ALARM)              |  | 626    | SCH |
| 1  | EA | RIM CYLINDER                        | 20-022 EV29 T   |  | 626    | SCH |
| 1  | EA | SURFACE CLOSER                      | <del>4040XP</del> <b>SCUSH MC</b> <del>(4040XP</del><br><b>SCUSH)</b> |  | 689    | LCN |
| 1  | EA | KICK PLATE                          | 8400 10" X 2" LDW B-CS  |  | 630    | IVE |
| 1  | EA | GASKETING                           | 188SBK PSA (HEADER &<br>JAMBS)  |  | BK     | ZER |
| 1  | EA | WIRE HARNESS (HINGE<br>TO HARDWARE) | CON-XX (LENGTH AS<br>REQUIRED)  |  | ↗      | SCH |
| 1  | EA | POWER SUPPLY WIRE<br>HARNESS        | CON-6W  |  | ↗      | SCH |
| 2  | EA | CREDENTIAL READER                   | BY DIVISION 28.   |  | ↗      |     |
| 1  | EA | LOW VOLTAGE POWER                   | BY LOW VOLTAGE  |  | ↗      |     |

USE SPRING CUSH ARM TO STOP DOOR  
 HARDWARE IS FOR OUTSWING DOOR. VERIFY SWINGING DIRECTION OF DOOR #2102

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED

PRESENTING VALID CREDENTIAL TEMPORARILY RELEASES LEVER FOR ENTRY

PRESENTING VALID CREDENTIAL FROM ROOM SIDE TEMPORARILY DISABLES THE LOCAL  
 ALARM AND DELAYED EGRESS FOR IMMEDIATE EXIT

PUSHING ACTUATION BAR WITHOUT VALID CREDENTIAL SOUNDS ALARM, MANUALLY RESET  
 ALARM

DOOR IS SECURED AT INGRESS SIDE UPON LOSS OF POWER TO THE LEVER TRIM









DOOR IS FOR IMMEDIATE EGRESS UPON ACTIVATION OF EMERGENCY SYSTEM, OR LOSS OF  
 POWER TO THE DEVICE

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 13

For use on Door #(s):  
 1201

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION                      | CATALOG NUMBER              |   | FINISH | MFR |
|----|----|----------------------------------|-----------------------------|---|--------|-----|
| Y  |    |                                  |                             |   |        |     |
| 3  | EA | HINGE                            | 5BB1HW 5 X 4.5              |  | 652    | IVE |
| 1  | EA | POWER TRANSFER                   | EPT10 CON                   |  | ↗ 689  | VON |
| 1  | EA | ELEC PANIC HARDWARE              | QEL-98-L-4'-06-CON 24 VDC   |  | ↗ 626  | VON |
| 1  | EA | RIM CYLINDER                     | 20-022 EV29 T               |  | 626    | SCH |
| 1  | EA | SURFACE CLOSER                   | 4040XP EDA MC               |  | 689    | LCN |
| 1  | EA | KICK PLATE                       | 8400 10" X 2" LDW B-CS      |  | 630    | IVE |
| 1  | EA | WALL STOP                        | WS406/407CCV                |  | 630    | IVE |
| 1  | EA | GASKETING                        | 488SBK PSA                  |  | BK     | ZER |
| 1  | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED) |   | ↗      | SCH |
| 1  | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                      |   | ↗      | SCH |
| 1  | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE              |   | ↗      |     |

CONNECT ELECTRIFIED DEVICE TO EMERGENCY SYSTEM

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED

DOOR MAY BY PROGRAMMED TO REMAIN UNLOCKED ON A SCHEDULE THROUGH ACCESS CONTROL SYSTEM

DOOR IS CLOSED AND SECURED UPON ACTIVATION OF EMERGENCY SYSTEM

FREE EGRESS AT ALL TIMES

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 14

For use on Door #(s):

1200A                      1200B                      1200C

Provide each PR door(s) with the following:

| QT |     | DESCRIPTION                         | CATALOG NUMBER                       |  | FINISH | MFR |
|----|-----|-------------------------------------|--------------------------------------|--|--------|-----|
| Y  |     |                                     |                                      |  |        |     |
| 6  | EA  | HINGE                               | 5BB1HW 4.5 X 4.5                     |  | 652    | IVE |
| 2  | EA  | POWER TRANSFER                      | EPT10 CON                            |  | ✓ 689  | VON |
| 1  | EA  | ELEC FIRE EXIT<br>HARDWARE          | QEL-9849-L-F-06-LBLAFL-CON<br>24 VDC |  | ✓ 626  | VON |
| 1  | EA  | ELEC FIRE EXIT<br>HARDWARE          | QEL-9849-L-F-06-LBL-CON 24<br>VDC    |  | ✓ 626  | VON |
| 2  | EA  | RIM CYLINDER                        | 20-022 EV29 T                        |  | 626    | SCH |
| 2  | EA  | SURFACE CLOSER                      | 4040XP EDA MC                        |  | 689    | LCN |
| 2  | EA  | KICK PLATE                          | 8400 10" X 1" LDW B-CS               |  | 630    | IVE |
| 2  | EA  | 35# MAGNET                          | SEM7850 12V/24V/120V                 |  | ✓ 689  | LCN |
| 1  | EA  | GASKETING                           | 188SBK PSA (HEADER &<br>JAMBS)       |  | BK     | ZER |
| 2  | SET | MEETING STILE                       | 328AA-S                              |  | AA     | ZER |
| 2  | EA  | DOOR BOTTOM                         | 355AA-FLO                            |  | AA     | ZER |
| 2  | EA  | WIRE HARNESS (HINGE<br>TO HARDWARE) | CON-XX (LENGTH AS<br>REQUIRED)       |  | ✓      | SCH |
| 2  | EA  | POWER SUPPLY WIRE<br>HARNESS        | CON-6W                               |  | ✓      | SCH |
| 1  | EA  | LOW VOLTAGE POWER                   | BY LOW VOLTAGE                       |  | ✓      |     |

CONNECT MAGNETIC DOOR HOLDER TO FIRE ALARM SYSTEM  
 CONNECT ELECTRIFIED DEVICE TO EMERGENCY SYSTEM

**OPERATION**









DOOR IS NORMALLY LATCHED AND SECURED  
 DOOR MAY BE PROGRAMMED TO REMAIN UNLOCKED ON A SCHEDULE THROUGH ACCESS  
 CONTROL SYSTEM  
 DOOR MAY BE HELD OPEN WITH MAGNETIC DOOR HOLDER  
 DOOR IS LATCHED AND SECURED UPON ACTIVATION OF FIRE ALARM OR EMERGENCY  
 SYSTEM, OR LOSS OF POWER TO THE MEGNETIC DOOR HOLDER  
 FREE EGRESS AT ALL TIMES

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 15

For use on Door #(s):  
 2322

Provide each PR door(s) with the following:




| QT |     | DESCRIPTION    | CATALOG NUMBER              |   | FINISH | MFR |
|----|-----|----------------|-----------------------------|---|--------|-----|
| Y  |     |                |                             |   |        |     |
| 6  | EA  | HINGE          | 5BB1HW 4.5 X 4.5            |  | 652    | IVE |
| 2  | EA  | PANIC HARDWARE | LD-9849-L-2SI-06-LBL        |  | 626    | VON |
| 4  | EA  | RIM CYLINDER   | 20-022 EV29 T               |  | 626    | SCH |
| 2  | EA  | SURFACE CLOSER | 4040XP SHCUSH MC            |  | 689    | LCN |
| 2  | EA  | KICK PLATE     | 8400 10" X 1" LDW B-CS      |  | 630    | IVE |
| 1  | EA  | GASKETING      | 188SBK PSA (HEADER & JAMBS) |  | BK     | ZER |
| 2  | SET | MEETING STILE  | 328AA-S                     |  | AA     | ZER |
| 2  | EA  | DOOR BOTTOM    | 355AA-FLO                   |  | AA     | ZER |

DOOR MAY BE HELD OPEN WITH CLOSER ARM

Hardware Group No. 16

For use on Door #(s):  
 1313A                      1313B

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION      | CATALOG NUMBER   |   | FINISH | MFR |
|----|----|------------------|------------------|---|--------|-----|
| Y  |    |                  |                  |   |        |     |
| 3  | EA | HINGE            | 5BB1 4.5 X 4.5   |  | 652    | IVE |
| 1  | EA | CLASSRM SEC LOCK | 195 DB           |   | 626    | MKS |
| 2  | EA | KIL CYLINDER     | 40-100 EV29 T135 |   | 626    | SCH |
| 1  | EA | OH STOP          | 90S              |  | 630    | GLY |
| 3  | EA | SILENCER         | SR64             |  | GRY    | IVE |







Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 17

For use on Door #(s):

1336B 1426B

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION                      | CATALOG NUMBER              |   | FINISH | MFR |
|----|----|----------------------------------|-----------------------------|---|--------|-----|
| Y  |    |                                  |                             |   |        |     |
| 3  | EA | HINGE                            | 5BB1HW 4.5 X 4.5            |  | 652    | IVE |
| 1  | EA | POWER TRANSFER                   | EPT10 CON                   |  | ↗ 695  | VON |
| 1  | EA | ELECTRIFIED LOCKSET              | EA195 FEU REX               |   | ↗ 626  | MKS |
| 1  | EA | KIL CYLINDER                     | 40-100 EV29 T135            |   | 626    | SCH |
| 1  | EA | SURFACE CLOSER                   | 4040XP MC                   |  | 689    | LCN |
| 1  | EA | KICK PLATE                       | 8400 10" X 2" LDW B-CS      |  | 630    | IVE |
| 1  | EA | 35# MAGNET                       | SEM7850 12V/24V/120V        |  | ↗ 689  | LCN |
| 1  | EA | GASKETING                        | 188SBK PSA (HEADER & JAMBS) |  | BK     | ZER |
| 1  | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED) |   | ↗      | SCH |
| 1  | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                      |   | ↗      | SCH |
| 1  | EA | CREDENTIAL READER                | BY DIVISION 28.             |   | ↗      |     |
| 1  | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE              |   | ↗      |     |

CONNECT MAGNETIC DOOR HOLDER TO EMERGENCY SYSTEM  
 DOOR MAY BE HELD OPEN WITH MAGNETIC DOOR HOLDER

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED

DOOR MAY BE HELD OPEN WITH THE MAGNETIC DOOR HOLDER

PRESENTING VALID CREDENTIAL TEMPORARILY RELEASES LEVER FOR ENTRY WHEN DOOR IS LOCKED

DOOR IS SECURED UPON LOSS OF POWER TO THE MAGNETIC DOOR HOLDER

FREE EGRESS AT ALL TIMES OPERATION:









Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 18

For use on Door #(s):

1301            1330                    1410A                    2113                    2310A                    2410  
 2410A

Provide each SGL door(s) with the following:

| QT<br>Y |    | DESCRIPTION                | CATALOG NUMBER                            |   | FINISH | MFR |
|---------|----|----------------------------|---|---|--------|-----|
| 3       | EA | HINGE                      | 5BB1HW 4.5 X 4.5                          |  | 652    | IVE |
| 1       | EA | FAC RESTRM /HOTEL<br>W/IND | L9486L 06A L583-363 L583-375              |  | 626    | SCH |
| 1       | EA | MORTISE CYLINDER           | 30-002 X L583-153 114 EV29<br>T135 36-083 |  | 626    | SCH |
| 1       | EA | SURFACE CLOSER             | 4040XP MC                                 |  | 689    | LCN |
| 1       | EA | KICK PLATE                 | 8400 10" X 2" LDW B-CS                    |  | 630    | IVE |
| 1       | EA | WALL STOP                  | WS406/407CCV                              |  | 630    | IVE |
| 1       | EA | GASKETING                  | 488SBK PSA                                |  | BK     | ZER |
| 1       | EA | COAT AND HAT HOOK          | 543                                       |  | 630    | IVE |






FACULTY RESTROOM  
 UNLOCK DOOR WITH MECHANICAL KEY

Hardware Group No. 19

For use on Door #(s):

1109            1220

Provide each SGL door(s) with the following:

| QT<br>Y |    | DESCRIPTION      | CATALOG NUMBER         |   | FINISH | MFR |
|---------|----|------------------|------------------------|---|--------|-----|
| 3       | EA | HINGE            | 5BB1HW 4.5 X 4.5       |  | 652    | IVE |
| 1       | EA | PRIVACY LATCHSET | 195 L                  |   | 626    | MKS |
| 1       | EA | SURFACE CLOSER   | 4040XP MC              |  | 689    | LCN |
| 1       | EA | KICK PLATE       | 8400 10" X 2" LDW B-CS |  | 630    | IVE |
| 1       | EA | WALL STOP        | WS406/407CCV           |  | 630    | IVE |
| 1       | EA | GASKETING        | 488SBK PSA             |  | BK     | ZER |








Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 20

For use on Door #(s):

1303                      1305                      1310                      1316                      1318                      1321  
 1323

Provide each SGL door(s) with the following:








| QT |    | DESCRIPTION      | CATALOG NUMBER         |   | FINISH | MFR |
|----|----|------------------|------------------------|---|--------|-----|
| Y  |    |                  |                        |   |        |     |
| 3  | EA | HINGE            | 5BB1HW 4.5 X 4.5       |  | 652    | IVE |
| 1  | EA | CLASSRM SEC LOCK | 195 DB                 |   | 626    | MKS |
| 2  | EA | KIL CYLINDER     | 40-100 EV29 T135       |   | 626    | SCH |
| 1  | EA | SURFACE CLOSER   | 4040XP MC              |  | 689    | LCN |
| 1  | EA | KICK PLATE       | 8400 10" X 2" LDW B-CS |  | 630    | IVE |
| 1  | EA | WALL STOP        | WS406/407CCV           |  | 630    | IVE |
| 1  | EA | GASKETING        | 488SBK PSA             |  | BK     | ZER |

Hardware Group No. 21

For use on Door #(s):

1114                      1115

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION        | CATALOG NUMBER                            |   | FINISH | MFR |
|----|----|--------------------|---|---|--------|-----|
| Y  |    |                    |   |   |        |     |
| 3  | EA | HINGE              | 5BB1HW 4.5 X 4.5                          |  | 652    | IVE |
| 1  | EA | PRIVACY W/DB & IND | L9496L 06A L583-363                       |  | 626    | SCH |
| 1  | EA | MORTISE CYLINDER   | 20-001 (CAM & RING AS<br>REQ'D) EV29 T135 |   | 626    | SCH |
| 1  | EA | SURFACE CLOSER     | 4040XP MC                                 |  | 689    | LCN |
| 1  | EA | KICK PLATE         | 8400 10" X 2" LDW B-CS                    |  | 630    | IVE |
| 1  | EA | WALL STOP          | WS406/407CCV                              |  | 630    | IVE |
| 1  | EA | GASKETING          | 488SBK PSA                                |  | BK     | ZER |
| 1  | EA | COAT AND HAT HOOK  | 543                                       |  | 630    | IVE |




Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 22

For use on Door #(s):

|       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 1120  | 1304A | 1304B | 1317A | 1317B | 1322A |
| 1322B | 1424  | 2302A | 2302B | 2306A | 2306B |
| 2313A | 2313B | 2316A | 2316B | 2402A | 2402B |
| 2406A | 2406B | 2413A | 2413B | 2416A | 2416B |

Provide each SGL door(s) with the following:




| QT |    | DESCRIPTION    | CATALOG NUMBER   |   | FINISH | MFR |
|----|----|----------------|------------------|---|--------|-----|
| Y  |    |                |                  |   |        |     |
| 3  | EA | HINGE          | 5BB1 4.5 X 4.5   |  | 652    | IVE |
| 1  | EA | CLASSROOM LOCK | 195 S            |   | 626    | MKS |
| 1  | EA | KIL CYLINDER   | 40-100 EV29 T135 |   | 626    | SCH |
| 1  | EA | OH STOP        | 90S              |  | 630    | GLY |
| 3  | EA | SILENCER       | SR64             |  | GRY    | IVE |

Hardware Group No. 23

For use on Door #(s):

|       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 1309  | 1314  | 1402A | 1402B | 1406A | 1406B |
| 1413A | 1413B | 1416A | 1416B | 2103  | 2323A |
| 2323C |       |       |       |       |       |

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION    | CATALOG NUMBER   |   | FINISH | MFR |
|----|----|----------------|------------------|---|--------|-----|
| Y  |    |                |                  |   |        |     |
| 3  | EA | HINGE          | 5BB1 4.5 X 4.5   |  | 652    | IVE |
| 1  | EA | CLASSROOM LOCK | 195 S            |   | 626    | MKS |
| 1  | EA | KIL CYLINDER   | 40-100 EV29 T135 |   | 626    | SCH |
| 1  | EA | OH STOP        | 90S J            |  | 630    | GLY |
| 3  | EA | SILENCER       | SR64             |  | GRY    | IVE |




Project: Ogden City Schools – Hillcrest Elementary (V4)  
Architect Job#: 22785

Hardware Group No. 24

For use on Door #(s):

1111                    2100

Provide each SGL door(s) with the following:






| QT |    | DESCRIPTION    | CATALOG NUMBER   |   | FINISH | MFR |
|----|----|----------------|------------------|---|--------|-----|
| Y  |    |                |                  |   |        |     |
| 3  | EA | HINGE          | 5BB1 4.5 X 4.5   |  | 652    | IVE |
| 1  | EA | CLASSROOM LOCK | 195 S            |   | 626    | MKS |
| 1  | EA | KIL CYLINDER   | 40-100 EV29 T135 |   | 626    | SCH |
| 1  | EA | WALL STOP      | WS406/407CCV     |  | 630    | IVE |
| 1  | EA | GASKETING      | 488SBK PSA       |  | BK     | ZER |

Hardware Group No. 25

For use on Door #(s):

1214A                    1214B

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION    | CATALOG NUMBER         |   | FINISH | MFR |
|----|----|----------------|------------------------|---|--------|-----|
| Y  |    |                |                        |   |        |     |
| 3  | EA | HINGE          | 5BB1HW 4.5 X 4.5       |   | 652    | IVE |
| 1  | EA | CLASSROOM LOCK | 195 S                  |   | 626    | MKS |
| 1  | EA | KIL CYLINDER   | 40-100 EV29 T135       |   | 626    | SCH |
| 1  | EA | SURFACE CLOSER | 4040XP HEDA MC         |  | 689    | LCN |
| 1  | EA | KICK PLATE     | 8400 10" X 2" LDW B-CS |  | 630    | IVE |
| 1  | EA | WALL STOP      | WS406/407CCV           |  | 630    | IVE |
| 3  | EA | SILENCER       | SR64                   |  | GRY    | IVE |





INSTALL HARDWARE TO ALLOW DOOR SWING MAXIMUM 180 DEGREES  
DOOR MAY BE HELD OPEN WITH CLOSER ARM

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 26

For use on Door #(s):  
 1204

Provide each SGL door(s) with the following:





| QT |    | DESCRIPTION                      | CATALOG NUMBER              |   | FINISH | MFR |
|----|----|----------------------------------|-----------------------------|---|--------|-----|
| Y  |    |                                  |                             |   |        |     |
| 3  | EA | HINGE                            | 5BB1 4.5 X 4.5              |  | 652    | IVE |
| 1  | EA | POWER TRANSFER                   | EPT10 CON                   |  | ✓ 689  | VON |
| 1  | EA | ELECTRIFIED LOCKSET              | EA195 FEU REX               |   | ✓ 626  | MKS |
| 1  | EA | KIL CYLINDER                     | 40-100 EV29 T135            |   | 626    | SCH |
| 1  | EA | WALL STOP                        | WS406/407CCV                |  | 630    | IVE |
| 3  | EA | SILENCER                         | SR64                        |  | GRY    | IVE |
| 1  | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED) |   | ✓      | SCH |
| 1  | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                      |   | ✓      | SCH |
| 1  | EA | CREDENTIAL READER                | BY DIVISION 28.             |   | ✓      |     |
| 1  | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE              |   | ✓      |     |

OPERATION:  
 DOOR IS NORMALLY LATCHED AND SECURED  
 PRESENTING VALID CREDENTIAL TEMPORARILY RELEASES LEVER FOR ENTRY  
 DOOR IS SECURED UPON LOSS OF POWER TO THE LOCK  
 FREE EGRESS AT ALL TIMES

Hardware Group No. 27

For use on Door #(s):  
 1203                      1215                      1218                      1219

Provide each SGL door(s) with the following:





| QT |    | DESCRIPTION    | CATALOG NUMBER         |   | FINISH | MFR |
|----|----|----------------|------------------------|---|--------|-----|
| Y  |    |                |                        |   |        |     |
| 3  | EA | HINGE          | 5BB1HW 4.5 X 4.5       |  | 652    | IVE |
| 1  | EA | CLASSROOM LOCK | 195 S                  |   | 626    | MKS |
| 1  | EA | KIL CYLINDER   | 40-100 EV29 T135       |   | 626    | SCH |
| 1  | EA | KICK PLATE     | 8400 10" X 2" LDW B-CS |  | 630    | IVE |
| 1  | EA | WALL STOP      | WS406/407CCV           |  | 630    | IVE |
| 3  | EA | SILENCER       | SR64                   |  | GRY    | IVE |

Project: Ogden City Schools – Hillcrest Elementary (V4)  
Architect Job#: 22785

Hardware Group No. 28

For use on Door #(s):  
1206D






Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION    | CATALOG NUMBER         |   | FINISH | MFR |
|----|----|----------------|------------------------|---|--------|-----|
| Y  |    |                |                        |   |        |     |
| 3  | EA | HINGE          | 5BB1HW 5 X 4.5         |  | 652    | IVE |
| 1  | EA | CLASSROOM LOCK | 195 S                  |   | 626    | MKS |
| 1  | EA | KIL CYLINDER   | 40-100 EV29 T135       |   | 626    | SCH |
| 1  | EA | KICK PLATE     | 8400 10" X 2" LDW B-CS |  | 630    | IVE |
| 1  | EA | WALL STOP      | WS406/407CCV           |  | 630    | IVE |
| 3  | EA | SILENCER       | SR64                   |  | GRY    | IVE |

Hardware Group No. 29

For use on Door #(s):  
1213

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION    | CATALOG NUMBER         |   | FINISH | MFR |
|----|----|----------------|------------------------|---|--------|-----|
| Y  |    |                |                        |   |        |     |
| 3  | EA | HINGE          | 5BB1HW 5 X 4.5 NRP     |  | 652    | IVE |
| 1  | EA | CLASSROOM LOCK | 195 S                  |   | 626    | MKS |
| 1  | EA | KIL CYLINDER   | 40-100 EV29 T135       |   | 626    | SCH |
| 1  | EA | SURFACE CLOSER | 4040XP HEDA MC         |  | 689    | LCN |
| 1  | EA | KICK PLATE     | 8400 10" X 2" LDW B-CS |  | 630    | IVE |
| 1  | EA | WALL STOP      | WS406/407CCV           |  | 630    | IVE |
| 3  | EA | SILENCER       | SR64                   |  | GRY    | IVE |






Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 30

For use on Door #(s):

1210                    1334

Provide each PR door(s) with the following:




| QT |    | DESCRIPTION       | CATALOG NUMBER         |   | FINISH | MFR |
|----|----|-------------------|------------------------|---|--------|-----|
| Y  |    |                   |                        |   |        |     |
| 6  | EA | HINGE             | 5BB1HW 4.5 X 4.5       |  | 652    | IVE |
| 1  | EA | MANUAL FLUSH BOLT | FB458                  |  | 626    | IVE |
| 1  | EA | CLASSROOM LOCK    | 195 S                  |   | 626    | MKS |
| 1  | EA | KIL CYLINDER      | 40-100 EV29 T135       |   | 626    | SCH |
| 2  | EA | KICK PLATE        | 8400 10" X 1" LDW B-CS |  | 630    | IVE |
| 2  | EA | WALL STOP         | WS406/407CCV           |  | 630    | IVE |
| 2  | EA | SILENCER          | SR64                   |  | GRY    | IVE |

Hardware Group No. 31

For use on Door #(s):

1103                    1106                    1108                    1112                    1113                    1221  
 1223                    1331                    2105                    2106                    2107                    2108  
 2109                    2110                    2111B

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION     | CATALOG NUMBER   |   | FINISH | MFR |
|----|----|-----------------|------------------|---|--------|-----|
| Y  |    |                 |                  |   |        |     |
| 3  | EA | HINGE           | 5BB1 4.5 X 4.5   |  | 652    | IVE |
| 1  | EA | OFF/ENT LOCKSET | 195 AB           |   | 626    | MKS |
| 1  | EA | KIL CYLINDER    | 40-100 EV29 T135 |   | 626    | SCH |
| 1  | EA | WALL STOP       | WS406/407CCV     |  | 630    | IVE |
| 1  | EA | GASKETING       | 488SBK PSA       |  | BK     | ZER |





Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 31A

For use on Door #(s):

1110                    2112

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION | CATALOG NUMBER                  |   | FINISH | MFR |
|----|----|-------------|---------------------------------|---|--------|-----|
| Y  |    |             |                                 |   |        |     |
| 3  | EA | HINGE       | 5BB1 4.5 X 4.5                  |  | 652    | IVE |
| 1  | EA | PASSAGE SET | L9010 06ALLL (TIME OUT<br>LOCK) |  | 626    | SCH |
| 1  | EA | WALL STOP   | WS406/407CVX                    |  | 630    | IVE |
| 1  | EA | GASKETING   | 488SBK PSA                      |  | BK     | ZER |





PROVIDE LOCK WITH NO TRIM ON THE INSIDE  
 WHEN THE LOCK IS IN A NATURAL POSITION THE LEVER WILL BE HORIZONTAL AND THE LATCH  
 WILL BE RETAINED INSIDE THE LOCK CASE  
 THE OUTSIDE LEVER, WHEN HELD UP, WILL PROJECT THE LATCH INTO THE STRIKE AND  
 PREVENT EXISTING FROM THE INTERIOR  
 AS SOON AS THE OUTSIDE LEVER IS RELEASED THE LATCH RETRACTS AND ALLOWS THE  
 DOOR TO BE PUSHED OPEN FROM THE INSIDE

Hardware Group No. 33

For use on Door #(s):

1332                    1333                    1421                    1422                    2321                    2421

Provide each SGL door(s) with the following:




| QT |    | DESCRIPTION    | CATALOG NUMBER   |   | FINISH | MFR |
|----|----|----------------|------------------|---|--------|-----|
| Y  |    |                |                  |   |        |     |
| 3  | EA | HINGE          | 5BB1 4.5 X 4.5   |  | 652    | IVE |
| 1  | EA | STOREROOM LOCK | 195 F            |   | 626    | MKS |
| 1  | EA | KIL CYLINDER   | 40-100 EV29 T135 |   | 626    | SCH |
| 1  | EA | SURFACE CLOSER | 4040XP MC        |  | 689    | LCN |
| 1  | EA | WALL STOP      | WS406/407CCV     |  | 630    | IVE |
| 1  | EA | GASKETING      | 488SBK PSA       |  | BK     | ZER |

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. [33A](#)

For use on Door #(s):  
[2200A](#)




Provide each SGL door(s) with the following:

| QT                |                    | DESCRIPTION                    | CATALOG NUMBER                   |   | FINISH              | MFR                 |
|-------------------|--------------------|--------------------------------|----------------------------------|---|---------------------|---------------------|
| Y                 |                    |                                |                                  |   |                     |                     |
| <a href="#">3</a> | <a href="#">EA</a> | <a href="#">HINGE</a>          | <a href="#">5BB1HW 4.5 X 4.5</a> |  | <a href="#">652</a> | <a href="#">IVE</a> |
| <a href="#">1</a> | <a href="#">EA</a> | <a href="#">STOREROOM LOCK</a> | <a href="#">195 F</a>            |   | <a href="#">626</a> | <a href="#">MKS</a> |
| <a href="#">1</a> | <a href="#">EA</a> | <a href="#">KIL CYLINDER</a>   | <a href="#">40-100 EV29 T135</a> |   | <a href="#">626</a> | <a href="#">SCH</a> |
| <a href="#">1</a> | <a href="#">EA</a> | <a href="#">SURFACE CLOSER</a> | <a href="#">4040XP SCUSH MC</a>  |  | <a href="#">689</a> | <a href="#">LCN</a> |
| <a href="#">1</a> | <a href="#">EA</a> | <a href="#">GASKETING</a>      | <a href="#">488SBK PSA</a>       |  | <a href="#">BK</a>  | <a href="#">ZER</a> |

Hardware Group No. 34

For use on Door #(s):  
 1107




Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION    | CATALOG NUMBER   |   | FINISH | MFR |
|----|----|----------------|------------------|---|--------|-----|
| Y  |    |                |                  |   |        |     |
| 3  | EA | HINGE          | 5BB1 4.5 X 4.5   |   | 652    | IVE |
| 1  | EA | STOREROOM LOCK | 195 F            |   | 626    | MKS |
| 1  | EA | KIL CYLINDER   | 40-100 EV29 T135 |   | 626    | SCH |
| 1  | EA | WALL STOP      | WS406/407CCV     |  | 630    | IVE |
| 3  | EA | SILENCER       | SR64             |  | GRY    | IVE |

Hardware Group No. 34A

For use on Door #(s):  
 1427

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION    | CATALOG NUMBER   |   | FINISH | MFR |
|----|----|----------------|------------------|---|--------|-----|
| Y  |    |                |                  |   |        |     |
| 3  | EA | HINGE          | 5BB1 4.5 X 4.5   |  | 652    | IVE |
| 1  | EA | STOREROOM LOCK | 195 F            |   | 626    | MKS |
| 1  | EA | KIL CYLINDER   | 40-100 EV29 T135 |   | 626    | SCH |
| 1  | EA | OH STOP        | 90S              |  | 630    | GLY |
| 3  | EA | SILENCER       | SR64             |  | GRY    | IVE |










Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 35

For use on Door #(s):  
 2111A





Provide each PR door(s) with the following:

| QT |    | DESCRIPTION             | CATALOG NUMBER      |   | FINISH | MFR |
|----|----|-------------------------|---------------------|---|--------|-----|
| Y  |    |                         |                     |   |        |     |
| 6  | EA | HINGE                   | 5BB1HW 4.5 X 4.5    |  | 652    | IVE |
| 2  | EA | MANUAL FLUSH BOLT       | FB458               |  | 626    | IVE |
| 1  | EA | DUST PROOF STRIKE       | DP1 OR DP2 AS REQ'D |  | 626    | IVE |
| 1  | EA | STOREROOM LOCK          | 195 F               |   | 626    | MKS |
| 1  | EA | KIL CYLINDER            | 40-100 EV29 T135    |   | 626    | SCH |
| 1  | EA | OH STOP                 | 90S                 |  | 630    | GLY |
| 1  | EA | SURFACE CLOSER          | 4040XP SHCUSH MC    |  | 689    | LCN |
| 1  | EA | OVERLAPPING<br>ASTRAGAL | 43STST              |  | STST   | ZER |
| 2  | EA | SILENCER                | SR64                |  | GRY    | IVE |

Hardware Group No. 36A

For use on Door #(s):  
 2320                    2420

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION      | CATALOG NUMBER                 |   | FINISH | MFR |
|----|----|------------------|--------------------------------|---|--------|-----|
| Y  |    |                  |                                |   |        |     |
| 4  | EA | HINGE            | 5BB1HW 5 X 4.5                 |  | 652    | IVE |
| 1  | EA | STOREROOM LOCK   | 195 F                          |   | 626    | MKS |
| 1  | EA | KIL CYLINDER     | 40-100 EV29 T135               |   | 626    | SCH |
| 1  | EA | OH STOP & HOLDER | 100F ADJ                       |  | 630    | GLY |
| 1  | EA | SURFACE CLOSER   | 4040XP MC                      |  | 689    | LCN |
| 1  | EA | GASKETING        | 188SBK PSA (HEADER &<br>JAMBS) |  | BK     | ZER |





DOOR MAY BE HELD OPEN WITH OVERHEAD STOP/HOLD OPEN  
 PROVIDE FOUR HINGES AT 48" WIDE DOOR  
 HARDWARE IS FOR 48" X 84" DOOR

Project: Ogden City Schools – Hillcrest Elementary (V4)  
Architect Job#: 22785

Hardware Group No. 37

For use on Door #(s):  
1116











Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION    | CATALOG NUMBER   |   | FINISH | MFR |
|----|----|----------------|------------------|---|--------|-----|
| Y  |    |                |                  |   |        |     |
| 3  | EA | HINGE          | 5BB1HW 5 X 4.5   |  | 652    | IVE |
| 1  | EA | STOREROOM LOCK | 195 F            |   | 626    | MKS |
| 1  | EA | KIL CYLINDER   | 40-100 EV29 T135 |   | 626    | SCH |
| 1  | EA | SURFACE CLOSER | 4040XP MC        |  | 689    | LCN |
| 1  | EA | WALL STOP      | WS406/407CCV     |  | 630    | IVE |
| 1  | EA | GASKETING      | 488SBK PSA       |  | BK     | ZER |

Hardware Group No. 38

For use on Door #(s):  
1222A

Provide each PR door(s) with the following:









| QT |    | DESCRIPTION         | CATALOG NUMBER         |   | FINISH | MFR |
|----|----|---------------------|------------------------|---|--------|-----|
| Y  |    |                     |                        |   |        |     |
| 6  | EA | HINGE               | 5BB1HW 4.5 X 4.5       |  | 652    | IVE |
| 1  | EA | CONST LATCHING BOLT | FB53                   |  | 630    | IVE |
| 1  | EA | STOREROOM LOCK      | 195 F                  |   | 626    | MKS |
| 1  | EA | KIL CYLINDER        | 40-100 EV29 T135       |   | 626    | SCH |
| 1  | EA | COORDINATOR         | COR X FL               |  | 628    | IVE |
| 2  | EA | MOUNTING BRACKET    | MB1 OR MB2 AS REQ'D    |  | 689    | IVE |
| 1  | EA | SURFACE CLOSER      | 4040XP EDA MC          |  | 689    | LCN |
| 1  | EA | SURFACE CLOSER      | 4040XP SCUSH MC        |  | 689    | LCN |
| 2  | EA | KICK PLATE          | 8400 10" X 1" LDW B-CS |  | 630    | IVE |
| 2  | EA | WALL STOP           | WS406/407CCV           |  | 630    | IVE |
| 1  | EA | GASKETING           | 488SBK PSA             |  | BK     | ZER |
| 1  | EA | MEETING STILE       | 44STST                 |  | STST   | ZER |

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 39

For use on Door #(s):  
 2200





Provide each PR door(s) with the following:

| QT |    | DESCRIPTION         | CATALOG NUMBER      |   | FINISH | MFR |
|----|----|---------------------|---------------------|---|--------|-----|
| Y  |    |                     |                     |   |        |     |
| 6  | EA | HINGE               | 5BB1HW 4.5 X 4.5    |  | 652    | IVE |
| 1  | EA | CONST LATCHING BOLT | FB51P               |  | 630    | IVE |
| 1  | EA | DUST PROOF STRIKE   | DP1 OR DP2 AS REQ'D |  | 626    | IVE |
| 1  | EA | STOREROOM LOCK      | 195 F               |   | 626    | MKS |
| 1  | EA | KIL CYLINDER        | 40-100 EV29 T135    |   | 626    | SCH |
| 1  | EA | COORDINATOR         | COR X FL            |  | 628    | IVE |
| 2  | EA | OH STOP             | 100S ADJ            |  | 630    | GLY |
| 2  | EA | SURFACE CLOSER      | 4040XP MC           |  | 689    | LCN |
| 1  | EA | GASKETING           | 488SBK PSA          |  | BK     | ZER |
| 1  | EA | MEETING STILE       | 44STST              |  | STST   | ZER |

Hardware Group No. 40

For use on Door #(s):  
 1410B                    2310B                    2410B

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION      | CATALOG NUMBER     |   | FINISH | MFR |
|----|----|------------------|--------------------|---|--------|-----|
| Y  |    |                  |                    |   |        |     |
| 3  | EA | HINGE            | 5BB1 4.5 X 4.5     |  | 652    | IVE |
| 1  | EA | SGL CYL DEADBOLT | B660P6 X EV29 T135 |  | 626    | SCH |
| 1  | EA | OH STOP          | 90S                |  | 630    | GLY |
| 3  | EA | SILENCER         | SR64               |  | GRY    | IVE |


Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. 41

For use on Door #(s):

|       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 1302B | 1306B | 1315B | 1319B | 1320B | 1324B |
| 1401B | 1403B | 1405B | 1407B | 1412B | 1414B |
| 1415B | 1417B | 2301B | 2303B | 2305B | 2307B |
| 2312B | 2314B | 2315B | 2317B | 2401B | 2403B |
| 2405B | 2407B | 2412B | 2414B | 2415B | 2417B |

Provide each SL door(s) with the following:

| QT |    | DESCRIPTION         | CATALOG NUMBER   | FINISH | MFR |
|----|----|---------------------|--|--------|-----|
| Y  |    |                     |  |        |     |
| 1  | EA | SLIDING DOOR SYSTEM | BI-PARTING SLIDE SYSTEM SECTION 083400  |        | ADS |
| 1  | EA | MORTISE CYL TURN    | 09-905 (CAM & RING AS REQ'D)   | 626    | SCH |
| 1  | EA | MORTISE CYLINDER    | 20-001 (CAM & RING AS REQ'D) EV29 T135   | 626    | SCH |
| 1  | EA | BALANCE HARWARE     | BY SLIDING DOOR MANUFACTURER   |        |     |

Hardware Group No. 42

For use on Door #(s):

|      |       |       |
|------|-------|-------|
| 1209 | 1211B | 1222B |
|------|-------|-------|

Provide each RU door(s) with the following:

| QT |    | DESCRIPTION | CATALOG NUMBER                                  | FINISH | MFR |
|----|----|-------------|---|--------|-----|
| Y  |    |             |   |        |     |
| 1  | EA | NOTE        | ALL HARDWARE BY ROLLUP DOOR SUPPLIER/CONTRACTOR |        |     |






Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. A01

For use on Door #(s):

1100A            1100B            1100C            1118A            1400A            1400B  
 1400C

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION                | CATALOG NUMBER                       |   | FINISH | MFR   |
|----|----|----------------------------|--------------------------------------|---|--------|---|
| Y  |    |                            |                                      |   |        |   |
| 1  | EA | CONT. HINGE                | 027XY                                |  | 710    | IVE   |
| 1  | EA | PANIC HARDWARE             | XP98-DT                              |  | 313    | VON   |
| 1  | EA | OH STOP                    | 100S ADJ                             |  | 695    | GLY   |
| 1  | EA | SURFACE CLOSER             | 4040XP EDAW/62G MC                   |  | 695    | LCN   |
| 1  | EA | DROP PLATE AND ACCESSORIES | PROVIDE AS NECESSARY                 |   | 695    |   |
| 1  | EA | WEATHERSTRIPPING           | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |   |
| 1  | EA | DOOR SWEEP                 | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |   |
| 1  | EA | THRESHOLD                  | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |   |
| 1  | EA | DOOR POSITION SWITCH       | BY DIVISION 28.                      |   |        |  |

MAG HOLDER REQUIRMENT GOT REMOVED  
 HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. A02

For use on Door #(s):

1100D 1118C

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION                      | CATALOG NUMBER                       |  | FINISH | MFR |
|----|----|----------------------------------|--------------------------------------|--|--------|-----|
| 1  | EA | CONT. HINGE                      | 027XY EPT                            |  | 710    | IVE |
| 1  | EA | POWER TRANSFER                   | EPT10 CON                            |  | ✓ 695  | VON |
| 1  | EA | ELEC PANIC HARDWARE              | LXRX-LC-QEL-XP98-NL-CON 24 VDC       |  | ✓ 313  | VON |
| 1  | EA | RIM CYLINDER                     | 20-022 EV29 T                        |  | 613    | SCH |
| 1  | EA | SURF. AUTO OPERATOR              | 4642 CS WMS 120 VAC                  |  | ✓ 695  | LCN |
| 1  | EA | WEATHER RING                     | 8310-801                             |  |        | LCN |
| 1  | EA | ACTUATOR, TOUCH                  | 8310-853T                            |  | ✓ 630  | LCN |
| 1  | EA | ACTUATOR, TOUCH                  | 8310-855                             |  | ✓ 630  | LCN |
| 1  | EA | WEATHERSTRIPPING                 | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 1  | EA | DOOR SWEEP                       | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 1  | EA | THRESHOLD                        | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 1  | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED)          |  | ✓      | SCH |
| 1  | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                               |  | ✓      | SCH |
| 1  | EA | CREDENTIAL READER                | BY DIVISION 28.                      |  | ✓      |     |
| 1  | EA | DOOR POSITION SWITCH             | BY DIVISION 28.                      |  | ✓      |     |
| 1  | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE                       |  | ✓      |     |

HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED  
 DOOR MAY BE PROGRAMMED TO REMAIN UNLOCKED ON A SCHEDULE THROUGH ACCESS CONTROL SYSTEM  
 PRESENTING VALID CREDENTIAL TEMPORALLY RETRACTS LATCHBOLT FOR ENTRY WHEN DOOR IS LOCKED  
 EXTERIOR ACTUATOR IS CONTROLLED THROUGH ACCESS CONTROL SYSTEM, INTERIOR IS ALWAYS ACTIVE  
 DOOR IS MONITORED THROUGH ACCESS CONTROL OR SECURITY SYSTEM  
 DOOR IS SECURED UPON LOSS OF POWER TO THE DEVICE  
 FREE EGRESS AT ALL TIMES





Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. A04

For use on Door #(s):

|       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 1100F | 1100G | 1100H | 1101C | 1101D | 1400E |
| 1400F | 1400G | 1400H |       |       |       |

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION                | CATALOG NUMBER                       |   | FINISH | MFR |
|----|----|----------------------------|--------------------------------------|---|--------|-----|
| Y  |    |                            |                                      |   |        |     |
| 1  | EA | CONT. HINGE                | 027XY                                |  | 628    | IVE |
| 1  | EA | DUMMY PUSH BAR             | 350-DT-990                           |  | 626    | VON |
| 1  | EA | OH STOP                    | 100S ADJ                             |  | 630    | GLY |
| 1  | EA | SURFACE CLOSER             | 4040XP ED AW/62G MC                  |  | 689    | LCN |
| 1  | EA | DROP PLATE AND ACCESSORIES | PROVIDE AS NECESSARY                 |   | 689    |     |
| 1  | EA | WEATHERSTRIPPING           | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |
| 1  | EA | THRESHOLD                  | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |






MAG HOLDER REQUIREMENT GOT REMOVED  
 HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS

Hardware Group No. A04A

For use on Door #(s):

|       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 1101A | 1101B | 2101A | 2101B | 2101C | 2101D |
|-------|-------|-------|-------|-------|-------|

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION                | CATALOG NUMBER                       |   | FINISH | MFR |
|----|----|----------------------------|--------------------------------------|---|--------|-----|
| Y  |    |                            |                                      |   |        |     |
| 1  | EA | CONT. HINGE                | 027XY                                |  | 628    | IVE |
| 1  | EA | DUMMY PUSH BAR             | 350-DT-990                           |  | 626    | VON |
| 1  | EA | OH STOP                    | 100S ADJ                             |  | 630    | GLY |
| 1  | EA | SURFACE CLOSER             | 4040XP ED AW/62G MC                  |  | 689    | LCN |
| 1  | EA | DROP PLATE AND ACCESSORIES | PROVIDE AS NECESSARY                 |   | 689    |     |
| 1  | EA | 35# MAGNET                 | SEM7850 12V/24V/120V                 |  | ↗ 689  | LCN |
| 1  | EA | WEATHERSTRIPPING           | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |
| 1  | EA | THRESHOLD                  | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |





HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS  
 DOOR MAY BE HELD OPEN WITH MAGNETIC DOOR HOLDER

Project: Ogden City Schools – Hillcrest Elementary (V4)  
Architect Job#: 22785

Hardware Group No. A05

For use on Door #(s):  
1100E

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION         | CATALOG NUMBER                          |   | FINISH | MFR |
|----|----|---------------------|---|---|--------|-----|
| Y  |    |                     |   |   |        |     |
| 1  | EA | CONT. HINGE         | 027XY                                   |  | 628    | IVE |
| 1  | EA | DUMMY PUSH BAR      | 350-DT-990                              |  | 626    | VON |
| 1  | EA | SURF. AUTO OPERATOR | 4642 CS WMS 120 VAC                     |  | ✓ 689  | LCN |
| 1  | EA | ACTUATOR, TOUCH     | 8310-853T                               |  | ✓ 630  | LCN |
| 1  | EA | WEATHERSTRIPPING    | BY ALUMINUM DOOR/FRAME<br>MANUFACTURER. |   |        |     |
| 1  | EA | THRESHOLD           | BY ALUMINUM DOOR/FRAME<br>MANUFACTURER. |   |        |     |

REFERENCE HARDWARE SET FOR EXTERIOR DOOR FOR DIRECTIONAL ACTUATOR AT  
VESTIBULE SIDE  
HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS  
VERIFY IF CARD READER IS REQUIRED AT #1100E, HARDWARE IS NOT FOR ACCESS CONTROL

OPERATION:  
ACTUATOR IS CONTROLLED BY OPERATOR











Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. A06

For use on Door #(s):

1326A 1419A

Provide each PR door(s) with the following:

| QT |    | DESCRIPTION                | CATALOG NUMBER                       |   | FINISH | MFR |
|----|----|----------------------------|--------------------------------------|---|--------|-----|
| Y  |    |                            |                                      |   |        |     |
| 2  | EA | CONT. HINGE                | 027XY                                |  | 710    | IVE |
| 1  | EA | REMOVABLE MULLION          | 4954 STAB                            |  | 695    | VON |
| 1  | EA | PANIC HARDWARE             | XP98-DT                              |  | 313    | VON |
| 1  | EA | PANIC HARDWARE             | XP98-NL                              |  | 313    | VON |
| 1  | EA | RIM CYLINDER               | 20-022 EV29 T                        |  | 613    | SCH |
| 2  | EA | OH STOP                    | 100S ADJ                             |  | 695    | GLY |
| 2  | EA | SURFACE CLOSER             | 4040XP EDAW/62G MC                   |  | 695    | LCN |
| 2  | EA | DROP PLATE AND ACCESSORIES | PROVIDE AS NECESSARY                 |   | 695    |     |
| 1  | EA | MULLION SEAL               | 8780NBK PSA                          |  | BK     | ZER |
| 1  | EA | WEATHERSTRIPPING           | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |
| 2  | EA | DOOR SWEEP                 | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |
| 1  | EA | THRESHOLD                  | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |
| 2  | EA | DOOR POSITION SWITCH       | BY DIVISION 28.                      |   |        |     |

HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. A06A

For use on Door #(s):  
 1335A

Provide each PR door(s) with the following:

| QT |    | DESCRIPTION                      | CATALOG NUMBER                       |  | FINISH | MFR |
|----|----|----------------------------------|--------------------------------------|--|--------|-----|
| Y  |    |                                  |                                      |  |        |     |
| 2  | EA | CONT. HINGE                      | 027XY EPT                            |  | 710    | IVE |
| 2  | EA | POWER TRANSFER                   | EPT10 CON                            |  | ✓ 695  | VON |
| 1  | EA | REMOVABLE MULLION                | 4954 STAB                            |  | 695    | VON |
| 1  | EA | ELEC PANIC HARDWARE              | RX-QEL-XP98-DT-CON 24 VDC            |  | ✓ 313  | VON |
| 1  | EA | ELEC PANIC HARDWARE              | RX-QEL-XP98-NL-CON 24 VDC            |  | ✓ 313  | VON |
| 1  | EA | RIM CYLINDER                     | 20-022 EV29 T                        |  | 613    | SCH |
| 2  | EA | OH STOP                          | 100S ADJ                             |  | 695    | GLY |
| 2  | EA | SURFACE CLOSER                   | 4040XP EDAA/62G MC                   |  | 695    | LCN |
| 2  | EA | DROP PLATE AND ACCESSORIES       | PROVIDE AS NECESSARY                 |  | 695    |     |
| 1  | EA | MULLION SEAL                     | 8780NBK PSA                          |  | BK     | ZER |
| 1  | EA | WEATHERSTRIPPING                 | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 2  | EA | DOOR SWEEP                       | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 1  | EA | THRESHOLD                        | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 2  | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED)          |  | ✓      | SCH |
| 2  | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                               |  | ✓      | SCH |
| 1  | EA | CREDENTIAL READER                | BY DIVISION 28.                      |  | ✓      |     |
| 2  | EA | DOOR POSITION SWITCH             | BY DIVISION 28.                      |  | ✓      |     |
| 1  | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE                       |  | ✓      |     |

HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED

DOOR MAY BE PROGRAMMED TO REMAIN UNLOCKED ON A SCHEDULE THROUGH ACCESS CONTROL SYSTEM

PRESENTING VALID CREDENTIAL TEMPORALLY RETRACTS LATCHBOLT FOR ENTRY WHEN DOOR IS LOCKED

DOOR IS MONITORED THROUGH ACCESS CONTROL OR SECURITY SYSTEM

DOOR IS SECURED UPON LOSS OF POWER TO THE DEVICE

FREE EGRESS AT ALL TIMES

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. A07

For use on Door #(s):

1326B 1419B

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION                      | CATALOG NUMBER                       |  | FINISH | MFR |
|----|----|----------------------------------|--------------------------------------|--|--------|-----|
| 1  | EA | CONT. HINGE                      | 027XY EPT                            |  | 628    | IVE |
| 1  | EA | POWER TRANSFER                   | EPT10 CON                            |  | ✓ 689  | VON |
| 1  | EA | ELEC PANIC HARDWARE              | RX-QEL-XP98-NL-CON 24 VDC            |  | ✓ 626  | VON |
| 1  | EA | RIM CYLINDER                     | 20-022 EV29 T                        |  | 626    | SCH |
| 1  | EA | OH STOP                          | 100S ADJ                             |  | 630    | GLY |
| 1  | EA | SURFACE CLOSER                   | 4040XP EDAW/62G MC                   |  | 689    | LCN |
| 1  | EA | DROP PLATE AND ACCESSORIES       | PROVIDE AS NECESSARY                 |  | 689    |     |
| 1  | EA | WEATHERSTRIPPING                 | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 1  | EA | THRESHOLD                        | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 1  | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED)          |  | ✓      | SCH |
| 1  | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                               |  | ✓      | SCH |
| 1  | EA | CREDENTIAL READER                | BY DIVISION 28.                      |  | ✓      |     |
| 1  | EA | DOOR POSITION SWITCH             | BY DIVISION 28.                      |  | ✓      |     |
| 1  | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE                       |  | ✓      |     |

HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED  
 DOOR MAY BE PROGRAMMED TO REMAIN UNLOCKED ON A SCHEDULE THROUGH ACCESS CONTROL SYSTEM  
 PRESENTING VALID CREDENTIAL TEMPORALLY RETRACTS LATCHBOLT FOR ENTRY WHEN DOOR IS LOCKED  
 DOOR IS MONITORED THROUGH ACCESS CONTROL OR SECURITY SYSTEM  
 DOOR IS SECURED UPON LOSS OF POWER TO THE DEVICE  
 FREE EGRESS AT ALL TIMES







Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. A08

For use on Door #(s):

2326                    2419

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION                      | CATALOG NUMBER                       |   | FINISH | MFR |
|----|----|----------------------------------|--------------------------------------|---|--------|-----|
| 1  | EA | CONT. HINGE                      | 027XY EPT                            |  | 628    | IVE |
| 1  | EA | POWER TRANSFER                   | EPT10 CON                            |  | ✓ 689  | VON |
| 1  | EA | ELEC PANIC HARDWARE              | LD-XP98-L-M996-06-FS-CON             |  | ✓ 626  | VON |
| 1  | EA | RIM CYLINDER                     | 20-022 EV29 T                        |  | 626    | SCH |
| 1  | EA | OH STOP                          | 100S ADJ                             |  | 630    | GLY |
| 1  | EA | SURFACE CLOSER                   | 4040XP EDAW/62G MC                   |  | 689    | LCN |
| 1  | EA | DROP PLATE AND ACCESSORIES       | PROVIDE AS NECESSARY                 |   | 689    |     |
| 1  | EA | WEATHERSTRIPPING                 | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |
| 1  | EA | THRESHOLD                        | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |
| 1  | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED)          |   | ✓      | SCH |
| 1  | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                               |   | ✓      | SCH |
| 1  | EA | CREDENTIAL READER                | BY DIVISION 28.                      |   | ✓      |     |
| 1  | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE                       |   | ✓      |     |

HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS  
 CONNECT FAIL SAFE TRIM TO EMERGENCY SYSTEM

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED

DOOR MAY BE PROGRAMMED TO REMAIN UNLOCKED ON A SCHEDULE THROUGH ACCESS CONTROL SYSTEM

PRESENTING VALID CREDENTIAL TEMPORALLY RETRACTS LATCHBOLT FOR ENTRY WHEN DOOR IS LOCKED

DOOR IS UNSECURED FOR STAIRWELL REENTRY UPON ACTIVATION OF EMERGENCY SYSTEM, OR LOSS OF POWER TO THE DEVICE





FREE EGRESS AT ALL TIMES

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. A09

For use on Door #(s):  
 1102A

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION                      | CATALOG NUMBER                       |   | FINISH | MFR |
|----|----|----------------------------------|--------------------------------------|---|--------|-----|
| 1  | EA | CONT. HINGE                      | 027XY EPT                            |  | 628    | IVE |
| 1  | EA | POWER TRANSFER                   | EPT10 CON                            |  | ✓ 689  | VON |
| 1  | EA | ELECTRIFIED LOCKSET              | EA195 FEU REX                        |   | ✓ 626  | MKS |
| 1  | EA | KIL CYLINDER                     | 40-100 EV29 T135                     |   | 626    | SCH |
| 1  | EA | OH STOP                          | 100S ADJ                             |  | 630    | GLY |
| 1  | EA | SURFACE CLOSER                   | 4040XP MC                            |  | 689    | LCN |
| 1  | EA | DROP PLATE AND ACCESSORIES       | PROVIDE AS NECESSARY                 |   | 689    |     |
| 1  | EA | WEATHERSTRIPPING                 | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |
| 1  | EA | THRESHOLD                        | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |
| 1  | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED)          |   | ✓      | SCH |
| 1  | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                               |   | ✓      | SCH |
| 1  | EA | CREDENTIAL READER                | BY DIVISION 28.                      |   | ✓      |     |
| 1  | EA | DOOR POSITION SWITCH             | BY DIVISION 28.                      |   | ✓      |     |
| 1  | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE                       |   | ✓      |     |

HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED  
 PRESENTING VALID CREDENTIAL TEMPORALLY RETRACTS LATCHBOLT FOR ENTRY WHEN DOOR IS LOCKED  
 DOOR IS SECURED UPON LOSS OF POWER TO THE DEVICE  
 FREE EGRESS AT ALL TIMES

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. A10

For use on Door #(s):

1336A                      1400D                      1426

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION                      | CATALOG NUMBER                       |  | FINISH | MFR |
|----|----|----------------------------------|--------------------------------------|--|--------|-----|
| Y  |    |                                  |                                      |  |        |     |
| 1  | EA | CONT. HINGE                      | 027XY EPT                            |  | 710    | IVE |
| 1  | EA | POWER TRANSFER                   | EPT10 CON                            |  | ✓ 695  | VON |
| 1  | EA | ELEC PANIC HARDWARE              | RX-QEL-XP98-NL-CON 24 VDC            |  | ✓ 313  | VON |
| 1  | EA | RIM CYLINDER                     | 20-022 EV29 T                        |  | 613    | SCH |
| 1  | EA | OH STOP                          | 100S ADJ                             |  | 695    | GLY |
| 1  | EA | SURFACE CLOSER                   | 4040XP EDAW/62G MC                   |  | 695    | LCN |
| 1  | EA | DROP PLATE AND ACCESSORIES       | PROVIDE AS NECESSARY                 |  | 695    |     |
| 1  | EA | WEATHERSTRIPPING                 | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 1  | EA | DOOR SWEEP                       | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 1  | EA | THRESHOLD                        | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 1  | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED)          |  | ✓      | SCH |
| 1  | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                               |  | ✓      | SCH |
| 1  | EA | CREDENTIAL READER                | BY DIVISION 28.                      |  | ✓      |     |
| 1  | EA | DOOR POSITION SWITCH             | BY DIVISION 28.                      |  | ✓      |     |
| 1  | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE                       |  | ✓      |     |

HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS  
 VERIFY IF CARD READER, ADA OPERATOR IS REQUIRED AT DOOR #1400D

OPERATION:





DOOR IS NORMALLY LATCHED AND SECURED  
 PRESENTING VALID CREDENTIAL TEMPORALLY RETRACTS LATCHBOLT FOR ENTRY  
 DOOR IS MONITORED THROUGH ACCESS CONTROL OR SECURITY SYSTEM  
 DOOR IS SECURED UPON LOSS OF POWER TO THE DEVICE  
 FREE EGRESS AT ALL TIMES

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. A11

For use on Door #(s):  
 1102B

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION                      | CATALOG NUMBER                       |   | FINISH | MFR |
|----|----|----------------------------------|--------------------------------------|---|--------|-----|
| 1  | EA | CONT. HINGE                      | 027XY EPT                            |  | 628    | IVE |
| 1  | EA | POWER TRANSFER                   | EPT10 CON                            |  | ✓ 689  | VON |
| 1  | EA | ELECTRIFIED LOCKSET              | EA195 FEU REX                        |   | ✓ 626  | MKS |
| 1  | EA | KIL CYLINDER                     | 40-100 EV29 T135                     |   | 626    | SCH |
| 1  | EA | SURFACE CLOSER                   | 4040XP MC                            |  | 689    | LCN |
| 1  | EA | DROP PLATE AND ACCESSORIES       | PROVIDE AS NECESSARY                 |   | 689    |     |
| 1  | EA | WALL STOP                        | WS406/407CCV                         |  | 630    | IVE |
| 1  | EA | WEATHERSTRIPPING                 | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |
| 1  | EA | THRESHOLD                        | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |
| 1  | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED)          |   | ✓      | SCH |
| 1  | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                               |   | ✓      | SCH |
| 1  | EA | DOOR POSITION SWITCH             | BY DIVISION 28.                      |   | ✓      |     |
| 1  | EA | DURESS BUTTON                    | BY DIVISION 28.                      |   | ✓ 630  |     |
| 1  | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE                       |   | ✓      |     |

HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS

OPERATION:





DOOR IS NORMALLY LATCHED AND SECURED  
 DOOR MAY BE PROGRAMMED TO REMAIN UNLOCKED ON A SCHEDULE THROUGH ACCESS CONTROL SYSTEM  
 PUSHING DURESS BUTTON LOCKS LEVER AT CORRIDOR SIDE DURING EMERGENCY  
 DOOR IS MONITORED THROUGH ACCESS CONTROL OR SECURITY SYSTEM  
 DOOR IS SECURED UPON LOSS OF POWER TO THE LOCK  
 FREE EGRESS AT ALL TIMES

Project: Ogden City Schools – Hillcrest Elementary (V4)  
Architect Job#: 22785

Hardware Group No. A12

For use on Door #(s):  
1335B

Provide each PR door(s) with the following:

| QT |    | DESCRIPTION                | CATALOG NUMBER                       |   | FINISH | MFR |
|----|----|----------------------------|--------------------------------------|---|--------|-----|
| Y  |    |                            |                                      |   |        |     |
| 2  | EA | CONT. HINGE                | 027XY                                |  | 628    | IVE |
| 2  | EA | DUMMY PUSH BAR             | 350-DT-990                           |  | 626    | VON |
| 2  | EA | OH STOP                    | 100S ADJ                             |  | 630    | GLY |
| 2  | EA | SURFACE CLOSER             | 4040XP EDAW/62G MC                   |  | 689    | LCN |
| 2  | EA | DROP PLATE AND ACCESSORIES | PROVIDE AS NECESSARY                 |   | 689    |     |
| 1  | EA | WEATHERSTRIPPING           | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |
| 1  | EA | THRESHOLD                  | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |

HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS



Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. A14

For use on Door #(s):  
 1118B

Provide each PR door(s) with the following:

| QT |    | DESCRIPTION                      | CATALOG NUMBER                       |  | FINISH | MFR |
|----|----|----------------------------------|--------------------------------------|--|--------|-----|
| Y  |    |                                  |                                      |  |        |     |
| 2  | EA | CONT. HINGE                      | 027XY EPT                            |  | 628    | IVE |
| 2  | EA | POWER TRANSFER                   | EPT10 CON                            |  | ✓ 689  | VON |
| 1  | EA | REMOVABLE MULLION                | 4954 STAB                            |  | 689    | VON |
| 1  | EA | ELEC PANIC HARDWARE              | LXRX-LC-QEL-XP98-NL-CON 24 VDC       |  | ✓ 626  | VON |
| 1  | EA | ELEC PANIC HARDWARE              | RX-QEL-XP98-EO-CON 24 VDC            |  | ✓ 626  | VON |
| 1  | EA | RIM CYLINDER                     | 20-022 EV29 T                        |  | 626    | SCH |
| 2  | EA | OH STOP                          | 100S ADJ                             |  | 630    | GLY |
| 1  | EA | SURFACE CLOSER                   | 4040XP ED AW/62G MC                  |  | 689    | LCN |
| 1  | EA | DROP PLATE AND ACCESSORIES       | PROVIDE AS NECESSARY                 |  | 689    |     |
| 1  | EA | SURF. AUTO OPERATOR              | 4642 CS WMS 120 VAC                  |  | ✓ 689  | LCN |
| 1  | EA | WEATHER RING                     | 8310-801                             |  |        | LCN |
| 2  | EA | ACTUATOR, TOUCH                  | 8310-853T                            |  | ✓ 630  | LCN |
| 1  | EA | MULLION SEAL                     | 8780NBK PSA                          |  | BK     | ZER |
| 1  | EA | WEATHERSTRIPPING                 | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 1  | EA | THRESHOLD                        | BY ALUMINUM DOOR/FRAME MANUFACTURER. |  |        |     |
| 2  | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED)          |  | ✓      | SCH |
| 2  | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                               |  | ✓      | SCH |
| 1  | EA | CREDENTIAL READER                | BY DIVISION 28.                      |  | ✓      |     |
| 1  | EA | DOOR POSITION SWITCH             | BY DIVISION 28.                      |  | ✓      |     |
| 1  | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE                       |  | ✓      |     |

HARDWARE IS FOR STOREFRONT SYSTEM WITH 2" THICK WIDE STILE DOORS

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED

DOOR MAY BE PROGRAMMED TO REMAIN UNLOCKED ON A SCHEDULE THROUGH ACCESS CONTROL SYSTEM

PRESENTING VALID CREDENTIAL TEMPORALLY RETRACTS LATCHBOLT FOR ENTRY WHEN DOOR IS LOCKED

EXTERIOR ACTUATOR IS CONTROLLED THROUGH ACCESS CONTROL SYSTEM, INTERIOR IS ALWAYS ACTIVE

DOOR IS MONITORED THROUGH ACCESS CONTROL OR SECURITY SYSTEM

DOOR IS SECURED UPON LOSS OF POWER TO THE DEVICE

FREE EGRESS AT ALL TIMES




Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. A15

For use on Door #(s):

1104                  1307                  1325                  2318

Provide each SGL door(s) with the following:




| QT |    | DESCRIPTION                | CATALOG NUMBER                       |   | FINISH | MFR |
|----|----|----------------------------|--------------------------------------|---|--------|-----|
| Y  |    |                            |                                      |   |        |     |
| 1  | EA | CONT. HINGE                | 027XY                                |  | 628    | IVE |
| 1  | EA | CLASSRM SEC LOCK           | 195 DB                               |   | 626    | MKS |
| 2  | EA | KIL CYLINDER               | 40-100 EV29 T135                     |   | 626    | SCH |
| 1  | EA | SURFACE CLOSER             | 4040XP MC                            |  | 689    | LCN |
| 1  | EA | DROP PLATE AND ACCESSORIES | PROVIDE AS NECESSARY                 |   | 689    |     |
| 1  | EA | WALL STOP                  | WS406/407CCV                         |  | 630    | IVE |
| 1  | EA | WEATHERSTRIPPING           | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |

Hardware Group No. A16

For use on Door #(s):

1311                  1404                  1408                  1418                  2304                  2308  
 2404                  2408                  2418

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION                | CATALOG NUMBER                       |   | FINISH | MFR |
|----|----|----------------------------|--------------------------------------|---|--------|-----|
| Y  |    |                            |                                      |   |        |     |
| 1  | EA | CONT. HINGE                | 027XY                                |  | 628    | IVE |
| 1  | EA | CLASSRM SEC LOCK           | 195 DB                               |   | 626    | MKS |
| 2  | EA | KIL CYLINDER               | 40-100 EV29 T135                     |   | 626    | SCH |
| 1  | EA | OH STOP                    | 100S ADJ                             |  | 630    | GLY |
| 1  | EA | SURFACE CLOSER             | 4040XP MC                            |  | 689    | LCN |
| 1  | EA | DROP PLATE AND ACCESSORIES | PROVIDE AS NECESSARY                 |   | 689    |     |
| 1  | EA | WEATHERSTRIPPING           | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |





VERIFY DOOR/FRAME MATERIAL AT #1408, #1311, #2408, #2308

Project: Ogden City Schools – Hillcrest Elementary (V4)  
 Architect Job#: 22785

Hardware Group No. A17

For use on Door #(s):  
 2104

Provide each SGL door(s) with the following:

| QT |    | DESCRIPTION                      | CATALOG NUMBER                       |   | FINISH | MFR |
|----|----|----------------------------------|--------------------------------------|---|--------|-----|
| 1  | EA | CONT. HINGE                      | 027XY EPT                            |  | 628    | IVE |
| 1  | EA | POWER TRANSFER                   | EPT10 CON                            |  | ✓ 689  | VON |
| 1  | EA | ELECTRIFIED LOCKSET              | EA195 FEU REX                        |   | ✓ 626  | MKS |
| 1  | EA | KIL CYLINDER                     | 40-100 EV29 T135                     |   | 626    | SCH |
| 1  | EA | OH STOP                          | 100S ADJ                             |  | 630    | GLY |
| 1  | EA | SURFACE CLOSER                   | 4040XP ED AW/62G MC                  |  | 689    | LCN |
| 1  | EA | DROP PLATE AND ACCESSORIES       | PROVIDE AS NECESSARY                 |   | 689    |     |
| 1  | EA | WEATHERSTRIPPING                 | BY ALUMINUM DOOR/FRAME MANUFACTURER. |   |        |     |
| 1  | EA | WIRE HARNESS (HINGE TO HARDWARE) | CON-XX (LENGTH AS REQUIRED)          |   | ✓      | SCH |
| 1  | EA | POWER SUPPLY WIRE HARNESS        | CON-6W                               |   | ✓      | SCH |
| 1  | EA | CREDENTIAL READER                | BY DIVISION 28.                      |   | ✓      |     |
| 1  | EA | LOW VOLTAGE POWER                | BY LOW VOLTAGE                       |   | ✓      |     |

VERIFY IF CARD READER IS REQUIRED AT #2104

OPERATION:

DOOR IS NORMALLY LATCHED AND SECURED  
 PRESENTING VALID CREDENTIAL TEMPORARILY RELEASES LEVER FOR ENTRY  
 DOOR IS SECURED UPON LOSS OF POWER TO THE LOCK  
 FREE EGRESS AT ALL TIMES

## SECTION 08 8000

### GLAZING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
  - 1. Windows.
  - 2. Doors.
  - 3. Glazed entrances.
  - 4. Interior borrowed lites.
- B. Related Sections:
  - 1. Section 05 5000 "Metal Fabrications" for aluminum glazing channels at interior locations.
  - 2. Section 08 8800 "Decorative Glass" for sand-blasted glass.

##### 1.3 DEFINITIONS

- A. **Manufacturer:** A firm that produces primary glass or fabricated glass as defined in referenced glazing publications.
- B. **Interspace:** Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- C. **Deterioration of Coated Glass:** Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.
- D. **Deterioration of Insulating Glass:** Failure of the hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

## 1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Glass Design: Glass thicknesses indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
    - a. Specified Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour (meters per second) at 33 feet above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.4.2, "Analytic Procedure," based on mean roof heights above grade indicated on Drawings.
    - b. Specified Design Snow Loads: As indicated, but not less than snow loads applicable to Project, required by ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 7, "Snow Loads."
    - c. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
      - 1) Load Duration: 60 seconds or less.
    - d. Maximum Lateral Deflection: For the following types of glass supported on all four edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch (25 mm), whichever is less.
      - 1) For monolithic-glass lites heat treated to resist wind loads.
      - 2) For insulating glass.
    - e. Minimum Glass Thickness for Exterior Lites: Not less than 6 mm.
    - f. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.
- C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
  2. For insulating-glass units, properties are based on units with lites 6 mm thick and a nominal 1/2-inch-wide interspace.
  3. Center-of-Glass U-Values: NFRC 100 methodology using LBL-35298 WINDOW 4.1 computer program, expressed as Btu/ sq. ft. x h x deg F.
  4. Center-of-Glass Solar Heat Gain Coefficient: NFRC 200 methodology using LBL-35298 WINDOW 4.1 computer program.
  5. Solar Optical Properties: NFRC 300.

## 1.5 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Samples: For the following products, in the form of 12-inch- square Samples for glass and of 12-inch- long Samples for sealants. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
  - 1. Each color of tinted float glass.
  - 2. Coated vision glass.
  - 3. Insulating glass for each designation indicated.
  - 4. For each color (except black) of exposed glazing sealant indicated.
- C. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
- E. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.
- F. Product Test Reports: From a qualified testing agency indicating the following products comply with requirements, based on comprehensive testing of current products:
  - 1. Tinted float glass.
  - 2. Coated float glass.
  - 3. Insulating glass.
  - 4. Glazing sealants.
  - 5. Glazing gaskets.
- G. Warranties: Special warranties specified in this Section.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: : An experienced installer who has completed glazing similar in material, design and extent to that indicated for this project; whose work has resulted in glass installations with a record of successful in-service performance.
- B. Source Limitations for Clear Glass: Obtain clear float glass from one primary-glass manufacturer.
- C. Source Limitations for Tinted Glass: Obtain tinted, heat-absorbing, and light-reducing float glass from one primary-glass manufacturer for each tint color indicated.
- D. Source Limitations for Coated Glass: Obtain coated glass from one manufacturer for each type of coating and each type of class of float glass indicated.
- E. Source Limitations for Insulating Glass: Obtain insulating-glass units from one manufacturer using the same type of glass and other components for each type of unit indicated.

- F. Source Limitations for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.
- G. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.
1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- H. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.
1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
  2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
- I. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing indicated below, samples of each glass type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants.
1. Use manufacturer's standard test methods to determine whether priming and other specific preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
    - a. Perform tests under normal environmental conditions replicating those that will exist during installation.
  2. Submit not fewer than nine pieces of each type and finish of glass-framing members and each type, class, kind, condition, and form of glass (monolithic, laminated, and insulating units) as well as one sample of each glazing accessory (gaskets, tape sealants, setting blocks, and spacers).
  3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
  4. For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
  5. Testing will not be required if elastomeric glazing sealant manufacturers submit data based on previous testing of current sealant products for adhesion to, and compatibility with, glazing materials matching those submitted.
- J. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
- K. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.
- L. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.
1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.

- M. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. GANA Publications: GANA'S "Glazing Manual" and "Laminated Glass Design Guide."
  2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
  3. SIGMA Publications: SIGMA TM-3000, "Vertical Glazing Guidelines," and SIGMA TB-3001, "Sloped Glazing Guidelines."
- N. Dual Seal Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following inspecting and testing agency:
1. Insulating Glass Certification Council.
  2. Associated Laboratories, Inc.
  3. National Accreditation and Management Institute.
- O. Provide a signed and dated certificate for the installed fenestration system listing the assembly U-factor, the solar heat gain coefficient and the air leakage rate. This is to meet the exception to the Labeling of Fenestration Products under Item 5.8.2.2 of the ANSI/ASHRA/IESNA STANDARD 90.1-2004.
1. Fenestration systems shall have a maximum assembly U value of 0.44 and a minimum SHGC of 0.42.
- P. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

## **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

## **1.8 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 degrees F.

## **1.9 WARRANTY**

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.



- B. Manufacturer's Special Warranty on Coated-Glass Products: Written warranty, made out to Owner and signed by coated-glass manufacturer agreeing to furnish replacements for coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
  - 1. Warranty Period: 10 years from date of Substantial Completion.
  
- C. Manufacturer's Special Warranty on Insulating Glass: Written warranty, made out to Owner and signed by insulating-glass manufacturer agreeing to furnish replacements for insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
  - 1. Warranty Period: 10 years from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.1 PRODUCTS AND MANUFACTURERS**

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products indicated in schedules at the end of Part 3.

### **2.2 PRIMARY FLOAT GLASS**

- A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), Quality q3 (glazing select); class as indicated in schedules at the end of Part 3.

### **2.3 HEAT-TREATED FLOAT GLASS**

- A. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
  
- B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent glass, flat); Quality q3 (glazing select); class, kind, and condition as indicated in schedules at the end of Part 3.

### **2.4 COATED FLOAT GLASS**

- A. General: Provide coated glass complying with requirements indicated in this Article and in schedules at the end of Part 3.
  - 1. Provide Kind HS (heat-strengthened) coated float glass in place of coated annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in "Performance Requirements" Article. Provide Kind FT (fully tempered) where safety glass is indicated.
  
- B. Sputter-Coated Float Glass: Float glass with metallic-oxide or metallic-nitride coating deposited by vacuum deposition process after manufacture and heat treatment (if any), complying with requirements specified in schedules at the end of Part 3.

## 2.5 SPANDREL GLASS

- A. Silicone-Coated Spandrel Glass: ASTM C 1048, Type I, Condition C, Quality-Q3.
- B. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
  - 1. Manufacturer: ICD High Performance Coatings.
  - 2. Product: OPACI-COAT-300®
- C. Application: Apply silicone coating to clear float glass (fully tempered, if required by silicone coating manufacturer or glazing contractor).
  - 1. Minimum Coating Thickness: 4-5 mils dry (0.004 to 0.005 inch).
  - 2. Color: Custom, as selected by Architect from samples and mockup review.

## 2.6 LAMINATED GLASS

- A. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
  - 1. Construction: Laminate glass with ionoplast interlayer to comply with interlayer manufacturer's written instructions.
  - 2. Interlayer Thickness: Provide thickness as needed to comply with requirements but not less than 2.28 mm (90 mils).
  - 3. Interlayer Color: Clear unless otherwise indicated.
  - 4. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
    - a. Manufacturer: Kuraray America, Inc.
    - b. Product: SentryGlas®
  - 5. Performance: Glazing shall have passed TAS 201 "Large Missile Impact".

## 2.7 INSULATING GLASS

- A. Insulating-Glass Units: Preassembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in the Insulating-Glass Schedule at the end of Part 3.
  - 1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in "Performance Requirements" Article. Provide Kind FT (fully tempered) where safety glass is indicated.
- B. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated in the Insulating-Glass Schedule at the end of Part 3 are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.

- C. Sealing System: Dual seal, with primary and secondary sealants as follows:
  - 1. Primary Seal: Polyisobutylene.
  - 2. Secondary Seal: Silicone.
- D. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:
  - 1. Aluminum with mill or clear-anodized finish.
  - 2. Desiccant: Molecular sieve or silica gel, or blend of both.
  - 3. Corner Construction: Manufacturer's standard corner construction.

## 2.8 ELASTOMERIC GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
  - 1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
  - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
  - 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range for this characteristic.
- B. Elastomeric Glazing Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied, chemically curing sealant in the Glazing Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.
  - 1. Additional Movement Capability: Where additional movement capability is specified in the Glazing Sealant Schedule, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements in ASTM C 920 for uses indicated.
- C. Glazing Sealant for Fire-Resistive Glazing Products: Identical to product used in test assembly to obtain fire-protection rating.

## 2.9 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; non-staining and non-migrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
  - 1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
- B. Expanded Cellular Glazing Tape: Closed-cell, PVC foam tape; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
  - 1. Type 1, for glazing applications in which tape acts as the primary sealant.
  - 2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

## **2.10 GLAZING GASKETS**

- A. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:
  - 1. Neoprene.
  - 2. EPDM.
  - 3. Silicone.
  - 4. Thermoplastic polyolefin rubber.
  - 5. Any material indicated above.

## **2.11 MISCELLANEOUS GLAZING MATERIALS**

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

## **2.12 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS**

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with indoor and outdoor faces.
- C. Grind smooth and polish exposed glass edges.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine framing glazing, with Installer present, for compliance with the following:
  - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
  - 2. Presence and functioning of weep system.
  - 3. Minimum required face or edge clearances.
  - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

### **3.3 GLAZING, GENERAL**

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where the length plus width is larger than 50 inches (as follows):
  - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
  - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

### **3.4 TAPE GLAZING**

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

### **3.5 GASKET GLAZING (DRY)**

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

- C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Install gaskets so they protrude past face of glazing stops.

### 3.6 SEALANT GLAZING (WET)

- A. **Install continuous spacers**, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. **Force sealants** into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. **Tool exposed surfaces** of sealants to provide a substantial wash away from glass.

### 3.7 PROTECTION AND CLEANING

- A. **Protect exterior glass** from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. **Protect glass from contact with contaminating substances** resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- C. **Examine glass surfaces** adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.
- D. **Remove and replace** glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.
- E. **Wash glass on both exposed surfaces** in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

### 3.8 MONOLITHIC FLOAT-GLASS SCHEDULE

- A. Mark 3: 1/4 inch clear float glass.
- B. Mark 4: 1/4 inch clear float glass with sandblasted pattern (refer to Section 08 8800 "Decorative Glass").

- C. Mark 5: 1/2 inch clear laminated glass.
- D. Mark 6: 1/2 inch clear laminated glass with sandblasted pattern (refer to Section 08 8800 "Decorative Glass").
- E. Mark 7: 3/4 inch clear laminated glass.
- F. Uncoated Clear Float Glass: Where glass as designated below is indicated, provide Type I (transparent glass, flat), Class 1 (clear) glass lites complying with the following:
  - 1. Uncoated Clear Annealed Float Glass: Annealed or Kind HS (heat strengthened), Condition A (uncoated surfaces) where heat strengthening is required to resist thermal stresses induced by differential shading of individual glass lites and to comply with performance requirements.
  - 2. Uncoated Clear Heat-Strengthened Float Glass: Kind HS (heat strengthened).
  - 3. Uncoated Clear Fully Tempered Float Glass: Kind FT (fully tempered). Provide as required and as indicated.

### 3.9 INSULATING-GLASS SCHEDULE

- A. Mark 1: Solar-Control Low-E Insulating-Glass Units:
  - 1. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other acceptable manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
    - a. Manufacturer: Vitro Architectural Glass
    - b. Products:
      - 1) Outdoor Lite: "Optigray"
      - 2) Low-E Coating: "Solarban 70".
      - 3) Indoor Lite: Clear (transparent) float.
  - 2. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by one of the following manufacturers. If not listed, submit as a substitution according to the Conditions of the Contract and provisions of Division 1 sections.
    - a. Vitro Architectural Glass
    - b. Guardian.
  - 3. Overall Unit Thickness: 1 inch.
  - 4. Thickness of Each Lite: 1/4 inch.
  - 5. Interspace Content: Air.
  - 6. Outdoor Lite: Class 1 "Optigray" float glass with "Solarban 70".
    - a. Provide HS (heat strengthened) or FT (fully tempered) glass as indicated on the drawings. If FT (fully tempered) glass is not indicated on the drawings; but is required by the governing code, provide FT (fully tempered) glass.
  - 7. Indoor Lite: Class 1 (clear) float glass.
    - a. Provide HS (heat strengthened) or FT (fully tempered) glass as indicated on the drawings. If FT (fully tempered) glass is not indicated on the drawings; but is required by the governing code, provide FT (fully tempered) glass.
  - 8. Low-E Coating: Sputtered on second surface.
  - 9. Visible Light Transmittance: 46 percent minimum.
  - 10. Winter Nighttime U-Factor: 0.28 maximum.
  - 11. Solar Heat Gain Coefficient: 0.23 maximum.
  - 12. Outdoor Visible Reflectance: 9.0 percent maximum.



- B. Mark 2: Translucent Solar-Control Low-E Insulating-Glass Units:
1. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other acceptable manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
    - a. Manufacturer: Vitro Architectural Glass
    - b. Products:
      - 1) Outdoor Lite: "Optigray"
      - 2) Low-E Coating: "Solarban 70".
      - 3) Indoor Lite: Sandblasted float glass (Division 8 Section "Decorative Glass").
  2. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by one of the following manufacturers. If not listed, submit as a substitution according to the Conditions of the Contract and provisions of Division 1 sections.
    - a. Vitro Architectural Glass
    - b. Guardian.
  3. Overall Unit Thickness: 1 inch.
  4. Thickness of Each Lite: 1/4 inch.
  5. Interspace Content: Air.
  6. Outdoor Lite: Class 1 "Optigray" float glass with "Solarban 70".
    - a. Provide HS (heat strengthened) or FT (fully tempered) glass as indicated on the drawings. If FT (fully tempered) glass is not indicated on the drawings; but is required by the governing code, provide FT (fully tempered) glass.
  7. Indoor Lite: Sandblasted float glass.
    - a. Provide HS (heat strengthened) or FT (fully tempered) glass as indicated on the drawings. If FT (fully tempered) glass is not indicated on the drawings; but is required by the governing code, provide FT (fully tempered) glass.
  8. Low-E Coating: Sputtered on #2 surface.
  9. Sandblasting: #3 surface
  10. Thermal Performance: Comparable to Type A.
- C. Mark 8: Spandrel Solar-Control Low-E Insulating-Glass Units:
1. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other acceptable manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
    - a. Manufacturer: Vitro Architectural Glass
    - b. Products:
      - 1) Outdoor Lite: "Optigray"
      - 2) Low-E Coating: "Solarban 70".
      - 3) Indoor Lite: Opaque spandrel, color as selected by Architect via samples and mockups.
  2. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by one of the following manufacturers. If not listed, submit as a substitution according to the Conditions of the Contract and provisions of Division 1 sections.
    - a. Vitro Architectural Glass
    - b. Guardian.

3. Overall Unit Thickness: 1 inch.
4. Thickness of Each Lite: 1/4 inch.
5. Interspace Content: Air.
6. Outdoor Lite: Class 1 "Optigray" float glass with "Solarban 70".
  - a. Provide HS (heat strengthened) or FT (fully tempered) glass as indicated on the drawings. If FT (fully tempered) glass is not indicated on the drawings; but is required by the governing code, provide FT (fully tempered) glass.
7. Indoor Lite: Sandblasted float glass.
  - a. Provide HS (heat strengthened) or FT (fully tempered) glass as indicated on the drawings. If FT (fully tempered) glass is not indicated on the drawings; but is required by the governing code, provide FT (fully tempered) glass.
8. Low-E Coating: Sputtered on #2 surface.
9. Spandrel Coating: #3 surface
10. Thermal Performance: Comparable to Type A.

D. Mark 9: Clear Insulating-Glass Units with Sandblasted Pattern

1. Overall Unit Thickness: 1 inch.
2. Thickness of Each Lite: 1/4 inch.
3. Interspace Content: Air.
4. Outdoor Lite: Class 1 clear float glass.
  - a. Provide HS (heat strengthened) or FT (fully tempered) glass as indicated on the drawings. If FT (fully tempered) glass is not indicated on the drawings; but is required by the governing code, provide FT (fully tempered) glass.
5. Indoor Lite: Sandblasted float glass - patterns.
  - a. Provide HS (heat strengthened) or FT (fully tempered) glass as indicated on the drawings. If FT (fully tempered) glass is not indicated on the drawings; but is required by the governing code, provide FT (fully tempered) glass.
6. Sandblasting: #2 surface – pattern to be furnished by Architect.

### 3.10 GLAZING SEALANT SCHEDULE

A. Low-Modulus Nonacid-Curing Silicone Glazing Sealant:

1. Products: Available products include the following:
  - a. 790; Dow Corning.
  - b. UltraPruf SCS2300; GE Silicones.
  - c. Spectrem 1; Tremco.
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Additional Movement Capability: 50 percent movement in extension and 50 percent movement in compression for a total of 100 percent movement.
5. Use Related to Exposure: NT (nontraffic).
6. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
  - a. Use O Glazing Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, and wood.

**END OF SECTION**

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## SECTION 08 8300

### MIRRORED GLASS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes safety (laminated) mirrored glass.

##### 1.3 DEFINITIONS

- A. Deterioration of Silvered Mirrored Glass: Defects developed from normal use that are attributable to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning silvered mirrored glass contrary to mirrored glass manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

##### 1.4 PERFORMANCE REQUIREMENTS

- A. Provide mirrored glass that will not fail under normal usage. Failure includes glass breakage and deterioration attributable to defective manufacture, fabrication, and installation.

##### 1.5 SUBMITTALS

- A. Product Data: For the following:
  - 1. Silvered mirrored glass. Include description of materials and process used to produce mirrored glass that indicates source of glass, glass coating components, edge sealer, and quality-control provisions.
  - 2. Mirror hardware.
- B. Shop Drawings: Include elevations, sections, details, and attachments to other Work.
- C. Samples for Verification: For the following products, in sizes indicated below:
  - 1. Mirrored glass, 12 inches square, including edge treatment on 2 adjoining edges.
  - 2. Mirror clips.
- D. Product Certificates: Signed by manufacturers of mirrored glass certifying that products furnished comply with requirements.
- E. Warranties: Special warranties specified in this Section.

##### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed mirrored glass installations similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.

- B. Source Limitations for Mirrored Glass: Obtain mirrored glass from one source for each type of mirrored glass indicated.
- C. Source Limitations for Glazing Accessories: Obtain glazing accessories from one source for each type of accessory indicated.
- D. Glazing Publications: Comply with published recommendations in GANA's "Glazing Manual," unless more stringent requirements are indicated. Refer to this publication for definitions of glass and glazing terms not otherwise defined in this Section or in referenced standards.
- E. NAAMM's Publication: For silvered mirrored glass, comply with recommendations in NAAMM's "Mirrors, Handle with Extreme Care, Tips for the Professional on the Care and Handling of Mirrors."
- F. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.

## **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Protect glazing materials according to mirrored glass manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. For silvered mirrored glass, comply with mirrored glass manufacturer's written instructions for shipping, storing, and handling mirrored glass as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors, protected from moisture including condensation.

## **1.8 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not install mirrored glass until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

## **1.9 WARRANTY**

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Manufacturer's Special Warranty for Silvered Mirrored Glass: Written warranty, made out to Owner and signed by mirrored glass manufacturer agreeing to replace silvered mirrored glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below:
  1. Warranty Period: Five years from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.1 LAMINATED MIRRORED GLASS**

- A. Silvered Laminated Mirrored Glass: Total thickness 1/4 inch: 1/8 inch clear glass, 0.030 PVB Interlayer, and 1/8 inch mirror with painted backing on 4th surface.

## **2.2 FABRICATION**

- A. Mirrored Glass Sizes: Cut mirrored glass to final sizes and shapes to suit Project conditions.
- B. Cutouts: Fabricate cutouts for notches and holes in mirrored glass without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrored glass.
- C. Mirrored Glass Edge Treatment: Treat edges as indicated below.
  - 1. Rounded polished edge.
  - 2. Seal edges of silvered mirrored glass after edge treatment to prevent chemical or atmospheric penetration of glass coating.
  - 3. Require mirrored glass manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

## **2.3 MISCELLANEOUS MATERIALS**

- A. Edge Sealer: Coating compatible with glass coating and approved by mirrored glass manufacturer for use in protecting against silver deterioration at mirrored glass edges.
- B. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.
- C. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, over which mirrored glass units are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance.
  - 1. Verify compatibility with and suitability of substrates.
  - 2. Proceed with mirrored glass installation only after unsatisfactory conditions have been corrected and surfaces are dry.

### **3.2 GLAZING**

- A. General: Install mirrored glass units to comply with written instructions of mirrored glass manufacturer and with referenced GANA and NAAMM publications. Mount mirrored glass accurately in place in a manner that avoids distorting reflected images.
- B. Provide space for air circulation between back of mirrored glass units and face of mounting surface.
- C. Seal edges of mirrors to reduce possibility of silver spoilage or failure

### **3.3 PROTECTION AND CLEANING**

- A. Protect mirrored glass from breakage and contaminating substances resulting from construction operations.
  - 1. Do not permit edges of silvered mirrored glass to be exposed to standing water.
  - 2. Maintain environmental conditions that will prevent silvered mirrored glass from being exposed to moisture from condensation or other sources for continuous periods of time.
  
- B. Wash mirrored glass not more than four days before date scheduled for inspections intended to establish date for Substantial Completion. Wash mirrored glass by methods recommended in NAAMM publication and in writing by mirrored glass manufacturer. Use water and glass cleaners free from substances capable of damaging mirrored glass edges or coatings.

**END OF SECTION**

## SECTION 08 8723.16

### SECURITY FILMS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. Section includes security films as indicated on Drawings.

##### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Security Film Samples: For each type of security film; 12 inches square.

##### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of security film, for tests performed by a qualified testing agency.

##### 1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
  - 1. Install each type of security film in one typical opening for each application. Film shall be neatly trimmed to fit openings. Seal perimeter per manufacturer's written instructions.
  - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

##### 1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with film application when ambient and substrate temperature conditions are outside limits permitted by film material manufacturers.

#### PART 2 - PRODUCTS

- A. Source Limitations for Security Film: Obtain security film from single source from single manufacturer using the same types of lites, plies, interlayers, and spacers for each security film type indicated.

##### 2.2 PERFORMANCE REQUIREMENTS

- A. General:
  - 1. Installed security film shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of film; or other defects in construction.



2. Installed security film shall withstand security-related loads and forces without damage to the film beyond that allowed by referenced standards.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on film framing members and film components.
1. Temperature Change: 120 degrees F, ambient; 180 degrees F, material surfaces.

**2.3 SECURITY FILM, GENERAL**

- A. Film Publications: Comply with published recommendations of security film and film material manufacturers and organizations below unless more stringent requirements are indicated. Refer to these publications for film terms not otherwise defined in this Section or in referenced standards.
- B. Plastic Film Labeling: Identify plastic sheets with appropriate markings of applicable testing and inspecting agency, indicating compliance with required fire-test-response characteristics.

**2.4 IMPACT FILM (TYPE "I")**

- A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
1. Manufacturer: Safe Haven Defense; safehavendefense.com
  2. Product: Smash Resistant Security Laminate.
- B. Optically clear, anti-fragmentation protective polymeric film, with an abrasion resistant coating on one side and a mounting adhesive on the other.
- C. Properties:
1. Film Color: Clear
  2. Thickness: 15 mils.
  3. Plies: 2
  4. Visible Light Transmission: 80%.
  5. UV Reduction: 99%
  6. ASTM D882 - Tensile Strength: 32,500 psi
  7. ASTM D882 – Break Strength: 450 psi
  8. Peel Strength: ASTM D3330: >6 psi.
  9. Impact Tests:
    - a. ANSI Z97.1: 2004: Class A
    - b. 16 CFR 1201 US Gov. Standard Test: CAT II
    - c. BS 6206; 1981: Class A
    - d. EN12600 Pendulum Test: Class 1B.
  10. Combustion: ASTM E84 Passes Class A

## 2.5 BALLISTIC FILM (TYPE "B")

- A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
1. Manufacturer: Safe Haven Defense; safehavendefense.com
  2. Product: Bullet Resistant Security Laminate; minimum UL Level 3 protection.
- B. Optically clear, anti-fragmentation protective polymeric film, with an abrasion resistant coating on one side and a mounting adhesive on the other.
1. Uniformity: No noticeable visual defects, such as pinholes, streaks, thin spots, scratches, or banding in accordance with the IWFA visual acceptance standard, after installation.
  2. Variation in Solar Specifications across Width: +/- 3 percent average at any portion of the length.
  3. Thickness: Nominal 12 mils (304.8 microns) with no evidence of coating voids, after the removal of the release liner.
  4. Identification: Labeled in accordance with manufacturer's specifications.
- C. Properties:
1. Film Color: Clear
  2. Visible Light Transmission: 80%.
  3. UV Reduction: 99%
  4. ASTM D882 - Tensile Strength: 32,500 psi
  5. ASTM D882 – Break Strength: 1200 psi
  6. Peel Strength: ASTM D3330: >6 psi.
  7. Impact Tests:
    - a. ANSI Z97.1: 2004: Class A
    - b. 16 CFR 1201 US Gov. Standard Test: CAT II
    - c. BS 6206; 1981: Class A
    - d. EN12600 Pendulum Test: Class 1B.
  8. Combustion Tests: ASTM E84-98 Surface Burning Test
    - a. Smoke Density: 35
    - b. Flame Spread Rating (NFPA Class A • UBC Class 1): 5
    - c. Time to Ignite: 92 seconds
    - d. Flame Front: 2 foot maximum
    - e. Rate of Burning: 0.1 in/sec.

## PART 3 - EXECUTION

### 3.1 FILM, GENERAL

- A. Comply with manufacturer's instructions for recommended surface preparation, cleaning and protection of the entire fenestration system.
- B. Install window films in accordance with manufacturer instructions.
- C. Apply sealant around film to secure film and glass in existing frame.

### **3.2 GLAZING SEALANT SCHEDULE**

- A. High Ultimate Tensile Strength Neutral-Curing Silicone Glazing Sealant:
  - 1. Available Products: Subject to compliance with requirements of Contract Documents, products which may be incorporated into the Work include, but are not limited to, the following:
    - a. Dowsil 995; Dow Corning.
  - 2. Type and Grade: S (single component) and NS (non-sag).
  - 3. Class: 50.
  - 4. Additional Movement Capability: 50 percent movement in extension and 50 percent movement in compression for a total of 100 percent movement.
  - 5. Use Related to Exposure: NT (non-traffic).
  - 6. Color: As selected by Architect from manufacturer's full range.

### **3.3 CLEANING AND PROTECTION**

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect security film from contact with contaminating substances resulting from construction operations, including weld splatter. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
  - 1. If, despite such protection, contaminating substances do come into contact with security film, remove substances immediately as recommended in writing by security film manufacturer. Remove and replace security film that cannot be cleaned without damage.
- C. Wash security film on exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash security film as recommended in writing by security film manufacturer.

**END OF SECTION**

**SECTION 08 8800**  
**DECORATIVE GLASS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes interior applications of the following:
  - 1. Sandblasted glass.
- B. Related Sections include the following:
  - 1. Section 08 8000 "Glazing" for monolithic and insulating-glass products and glazing requirements.

**1.3 DEFINITIONS**

- A. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's directions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated glass standard.

**1.4 SYSTEM PERFORMANCE REQUIREMENTS**

- A. General: Provide glazing systems that are produced, fabricated, and installed to withstand normal thermal movement and impact loading (where applicable), without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; deterioration of glazing materials; or other defects in construction.
- B. Glass Design: Glass thicknesses indicated on Drawings are for detailing only. Confirm glass thicknesses by analyzing in-service conditions.

**1.5 SUBMITTALS**

- A. Product Data for each glass product and glazing material specified.
- B. Shop Drawings detailing design and pattern location for each decorative glass unit. Include the following:
  - 1. Size and location of penetrations.
  - 2. Glazing method.
- C. Samples for verification of the following products, in manufacturer's standard sizes, showing the full range of color, texture, and pattern variations expected. Prepare Samples from the same material to be used for the Work.
  - 1. Decorative Glass: Manufacturer's standard-size unit, not less than 12 inches square, packaged to prevent breakage. Protect edges of sample.

- D. Product certificates signed by manufacturers of decorative glass certifying that their products comply with specified requirements.
  - 1. Separate certifications are not required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality-control program of a recognized certification agency or an independent testing agency acceptable to authorities having jurisdiction.
- E. Sealant compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials have been tested for compatibility and adhesion with glazing sealants; include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.
- G. Maintenance data for decorative glass to include in the operation and maintenance manual specified in Division 1.

## **1.6 QUALITY ASSURANCE**

- A. Glazing Publications: Comply with published recommendations of product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise in this Section or in referenced standards.
  - 1. FGMA Publication: "FGMA Glazing Manual."
  - 2. FGMA Publication: "FGMA Sealant Manual."
  - 3. LSGA Publication: "LSGA Design Guide."
- B. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of CPSC 16 CFR, Part 1201 for Category I and II materials.
  - 1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or another certification agency acceptable to authorities having jurisdiction.
- C. Glazier Qualifications: Engage an experienced glazier who has completed glazing similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- D. Single-Source Responsibility: Obtain each type of decorative glass from one source and by a single manufacturer for each product and installation method indicated.

## **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Protect glazing materials to comply with manufacturer's directions and as needed to prevent damage to glass and glazing materials.

## **1.8 PROJECT CONDITIONS**

- A. Field Measurements: Check actual decorative glass openings by accurate field measurements before fabrication and show recorded measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Where field measurements cannot be made without delaying the Work, guarantee opening dimensions and proceed with fabricating decorative glass without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions.

- B. Space Enclosure and Environmental Limitations: Do not install decorative glass until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
  - 1. Sand blasted glass
    - a. Architectural Glass Art Inc.
    - b. Creative Central.

### **2.2 PRIMARY FLOAT-GLASS PRODUCTS**

- A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), Class 1 (clear), unless otherwise indicated, and Quality q3 (glazing select).

### **2.3 HEAT-TREATED FLOAT GLASS**

- A. Uncoated, Clear, Heat-Treated Float Glass: ASTM C 1048, Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), unless otherwise indicated, Quality q3 (glazing select), kind as indicated below:
  - 1. Kind HS (heat strengthened) where indicated.
  - 2. Kind FT (fully tempered) where indicated.

### **2.4 LAMINATED GLASS**

- A. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
  - 1. Construction: Laminate glass with ionoplast interlayer to comply with interlayer manufacturer's written instructions.
  - 2. Interlayer Thickness: Provide thickness as needed to comply with requirements but not less than 2.28 mm (90 mils).
  - 3. Interlayer Color: Clear unless otherwise indicated.
  - 4. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
    - a. Manufacturer: Kuraray America, Inc.
    - b. Product: SentryGlas®
  - 5. Performance: Glazing shall have passed TAS 201 "Large Missile Impact".

### **2.5 SANDBLASTED GLASS**

- A. Sandblasted-Glass Units: Abrade sandblasted glass evenly, with small particles of sand forced through a high-pressure air nozzle according to manufacturer's standard process.
  - 1. Anti-fingerprint Coating: Protective coating, apply as per manufacturer's recommendation.
  - 2. Patterns and Graphics: Provide graphics and patterns as indicated on the drawings.

## 2.6 GLAZING SEALANTS

- A. General: Provide manufacturer's standard sealant of formulation indicated that is recommended for exposed interior applications, complying with the following requirements:
  - 1. Compatibility: Select glazing sealants of proven compatibility with other materials they will contact, including glass products and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
  - 2. Suitability: Comply with sealant and glass manufacturer's recommendations for selecting glazing sealants that are suitable for applications indicated and conditions existing at time of installation.
  - 3. Colors: Provide color of exposed joint sealants to comply with the following:
    - a. Match colors indicated by referencing manufacturer's standard designations for these characteristics.
    - b. Provide Architect's selections from manufacturer's full range of standard colors for products of type indicated.
- B. Latex Sealant: One-part, nonsag, mildew-resistant, paintable latex sealant complying with ASTM C 834.

## 2.7 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials involved for glazing application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Type recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material complying with ASTM C 864 with a Shore A durometer hardness of 85 plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions complying with ASTM C 864 with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement.
- F. Plastic-Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonextruding, nonoutgassing strips of closed-cell plastic foam of density, size, and shape to control sealant depth and otherwise contribute to produce optimum sealant performance.

## 2.8 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- A. Fabricate decorative glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard.
- B. Clean cut or flat grind vertical edges of butt-glazed lites in a manner that produces square edges with slight kerfs.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine glass framing, with glazier present, for compliance with the following:
  - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
  - 2. Minimum required face or edge clearances.
- B. Do not proceed with glazing until unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

### **3.3 GLAZING, GENERAL**

- A. Comply with combined recommendations of manufacturers of glass, sealants, and other glazing materials, except where more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions as indicated on Drawings provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass from edge damage during handling and installation as follows:
  - 1. Use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar.
  - 2. Remove damaged glass from Project site and legally dispose of off-site. Damaged glass is glass with edge damage or other imperfections that, when installed, weaken glass and impair performance and appearance.
  - 3. Retain below if required.
- D. Provide spacers as follows:
  - 1. Locate spacers inside, outside, and directly opposite each other. Install correct size and spacing to preserve required face clearances.
  - 2. Provide not less than 1/8-inch bite of spacers on glass and use thickness equal to sealant width.
- E. Set decorative glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

### **3.4 SEALANT GLAZING**

- A. Install continuous spacers between glass lites and glazing stops to maintain glass-face clearance. Secure spacers in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces smooth.



### **3.5 CLEANING AND PROTECTION**

- A. Protect glass from breakage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- C. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including by natural causes, accidents, and vandalism, during construction period.
- D. Wash glass on both faces in each area of Project not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

**END OF SECTION**

## **DIVISION 09 – FINISHES**

|                    |                                     |
|--------------------|-------------------------------------|
| Section 09 0001    | Finish Schedule                     |
| Section 09 2216    | Non-Structural Metal Framing        |
| Section 09 2900    | Gypsum Board                        |
| Section 09 3013    | Ceramic Tiling                      |
| Section 09 5113    | Acoustical Panel Ceilings           |
| Section 09 6513    | Resilient Wall Base and Accessories |
| Section 09 6519.23 | Vinyl Tile Flooring                 |
| Section 09 6723    | Resinous Flooring                   |
| Section 09 6813    | Tile Carpeting                      |
| Section 09 7713    | Decorative Metal Wall Panels        |
| Section 09 8433    | Acoustical Wall and Ceiling Panels  |
| Section 09 9100    | Painting                            |

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**FINISH SELECTION - DAVIS ELEMENTARY SCHOOL ONE**  
**June 28, 2022**

|  |                         |   |
|--|-------------------------|---|
| CSBA: Color selected by Architect  |                         |   |
| SCSBA: Standard Color Selected By Architect from Manuf.'s Full Range                       |                         |   |
| CCSBA: Custom Color Selected by Architect  |                         |   |
|  |                         |   |
| <b>MATERIAL</b>  | <b>MANUFACTURER</b>     | <b>DESCRIPTION</b>                            |
| <b>Exterior Masonry – smooth</b>   | Amcor                   | Amber Gray                                    |
| – split face   | Amcor                   | Amber Gray                                    |
|  |                         |   |
| <b>Interior Masonry – honed</b>  | Amcor                   | Amber Gray                                    |
| <b>Exterior Concrete below Metal Tile Walls</b>  |                         | Clear, sealed                                 |
|  |                         |   |
| <b>Exterior Metal</b>  |                         |   |
| Vertical Metal Panels, see elevations for color locations                                  | MBCI; Color 1 (orange): | <b>CCSBA</b>                                  |
|  | MBCI; Color 2 (yellow): | <b>CCSBA</b>                                  |
|  | MBCI; Color 3 (blue):   | <b>CCSBA</b>                                  |
|  | MBCI; Color 4 (purple): | <b>CCSBA</b>                                  |
|  | MBCI; Color 4 (white):  | CSBA  |
|  |                         |   |
| Horizontal Metal Siding  | MBCI                    | CSBA  |
| Metal Soffit   | MBCI                    | CSBA  |
| Metal Cap @ Masonry  | MBCI                    | To match masonry                              |
| Metal Cap @ Vertical Metal Siding  | MBCI                    | See Exterior Elev's                           |
| Metal Cap @ Horizontal Metal Siding  | MBCI                    | To match wall panel                           |
| Ext. Hollow Metal Doors/Frames (see interior HM Doors below, for interior side door color) | PPG                     | PPG 14-14 Summer Suede                        |
| Alum. Curtain Wall /Storefront Windows/Doors   |                         | Clear Anodized                                |
| Sunshade Frames  |                         | Charcoal                                      |
|  |                         |   |
| <b>Glass</b>   |                         |   |
| Exterior Glazing   |                         | Solexia Green                                 |
|  |                         |   |
| <b>Interior Metal</b>  |                         |   |
| Int. H.M. Frames at classroom entries  | Varies                  | See accent paint @ areas 12 and 22 (4 colors) |
| Int. H.M. Frames, excluding above  | Sherwin Williams        | 7019 Gauntlet Gray                            |
| Int. H.M. Doors  | PPG                     | PPG 14-14 Summer Suede                        |
| Exposed deck & structure, u.n.o.   | Sherwin Williams        | 7076 Cyberspace (dark grey)                   |

|  |                                       |  |
|--|---------------------------------------|--|
| Exposed deck & structure (White)   | Sherwin Williams                      | 7006 Extra White                                       |
| Metal Stringers  | Sherwin Williams                      | 7019 Gauntlet Gray                                     |
| Metal Lockers in Kitchen   | Hadrian                               | SCSBA  |
|  |                                       |  |
| <b>Wood Doors</b>  |                                       |  |
| Wood Doors   | Marshfield                            | Maple - Stain color;<br>Custom Color<br>266688C        |
|  |                                       |  |
| <b>Architectural Stained Ground Concrete</b>   |                                       | CCSBA (Grey - two shades)                              |
|  |                                       |  |
| <b>Entry Mat Carpet</b>  | Milliken Obex Tile                    | Style: CutX / Drift<br>Color: DTX5-27 Grey             |
|  |                                       |  |
| <b>Carpet, Provided by Owner</b>   |                                       |  |
| Field carpet - Classrooms  | Milliken – Color Field Tile (F11)     | Style:<br>Color:                                       |
| Field Carpet – General (See floor pattern plans for accent carpet at Collaboration Spaces) | Milliken – Color Field Tile (F1, F2)  | Style:<br>Color:                                       |
| Accent Carpet 1 (Blue)   | Milliken – Color Field Tile (F2, F10) | Style:<br>Color:                                       |
| Accent Carpet 2 (Green)  | Milliken – Color Field Tile (F2, F10) | Style:<br>Color:                                       |
| Accent Carpet 1 (Red)  | Milliken – Color Field Tile (F2, F10) | Style:<br>Color:                                       |
| Accent Carpet 2 (Yellow)   | Milliken – Color Field Tile (F2, F10) | Style:<br>Color:                                       |
| Field Carpet - Administration & Media  | Milliken – Color Field Tile (F3)      | Style:<br>Color:                                       |
|  |                                       |  |
| <b>Carpet Base, Provided by Owner</b>  | Milliken                              | CSBA to Match Adj.<br>Carpet Flooring                  |
|  |                                       |  |
| <b>Transition Strip @ Rubber/Carpet</b>  | Tandus Centiva 'MetalEdge'            |  |
|  |                                       |  |
| <b>Rubber Base and Transition Strip</b>  | Tarket                                | 029 Moon Rock  |
| <b>Rubber Floor Tiles</b>  | Tarket                                | 029 Moon Rock  |
|  |                                       |  |
| <b>Tile</b>  |                                       |  |
| <b>Porcelain Ceramic Wall Tile</b>   |                                       |  |
| 6 x 24   | Dal-Tile Santino                      | SN06 Bianco<br>Grout: Custom Bldg<br>Products 382 Bone |

|  |                    |   |
|--|--------------------|---|
| <b>Ceramic Toilet Room &amp; Kitchen Wall Tiles</b>  |                    |   |
| Field color 3x6                                      | Dal-Tile           | 0790 MT Arctic White (Matte);<br>Grout: Custom Bldg Products #386 Oyster Gray       |
| Accent 3x6 (Gray)                                    | Dal-Tile           | 0709 Architectural Gray DT (Matte);<br>Grout: Custom Bldg Products #386 Oyster Gray |
| <b>Ceramic Toilet Room Floor Tiles</b>               |                    |   |
| 8x8  | Dal-Tile Porcelain | CD41 Pepe Grigio<br>Grout: Custom Bldg Products #541 Walnut                         |
| 2X2  | Dal-Tile Keystones | D109 Architectural Gray<br>Grout: Custom Bldg Products #541 Walnut                  |
| <b>Resinous Flooring</b>                             | Stonhard           | SCSBA   |
| <b>Pre-molded resin threshold</b>                    | Living Stone       | SCSBA   |
| <b>Paint – Refer to drawings for color locations</b> |                    |   |
| General Paint  | Sherwin Williams   | SW7006 Extra White (White)  |
| Accent #1A (teal)                                    | PPG                | PPG 1147-6 Jade Jewel   |
| Accent #1B (green)                                   | PPG                | PPG 1117-6 Do Not Disturb   |
| Accent #2A (orange)                                  | Sherwin Williams   | SW 6643 Yam   |
| Accent #2B (purple)                                  | PPG                | PPG 1176-6 Mirabella  |
| Accent #3 (blue)                                     | PPG                | PPG 1157-6 Cosmic Dust  |
| "Black" Deck and exposed structure in Media Center   | Sherwin Williams   | SW6993 Black of Night (black)   |
| <b>Wall Vinyl - Tackable Panels and Tack boards</b>  |                    |   |
| Wall Panels and Tack Boards                          | Koroseal           | Desert Sand w/Teflon;<br>WHITE 5851-02  |
| Typical channel color                                |                    | CSBA from full range of colors  |

|   |                          |  |
|---|--------------------------|--|
| <b>Millwork Laminate</b>  |                          |  |
| General PL – base cabinet bodies & doors  | Formica                  | 8824-58 White Drops (White/Beige);<br>EDGE BANDING:<br>Doelken 2145 Surf |
| Countertops - typical   | Wilsonart                | 5016-38 French Linen;<br>EDGE BANDING:<br>SCSBA                          |
| Media 2101, Reception 1101<br>- Quartz Solid Surface Top<br>- Plastic Laminate Cabinet Body / Doors / Drawers                   | Radianz<br><br>Wilsonart | Top: Mont Blanc Snow MS141;<br><br>Body/Doors: 5016-38 French Linen      |
| Serving platform;<br>- Quartz Solid Surface Top<br>- Plastic Laminate Side Panels   | Radianz<br><br>Wilsonart | Top: Mont Blanc Snow MS141<br><br>Side Panels: 5016-38 French Linen      |
| Mobile cabinets   | Formica                  | match typical millwork   |
| Interior Melamine   |                          | White  |
| Millwork Edge banding   |                          | Multiple Colors to match plastic laminates                               |
| Solid Surface Countertops / Sills (where noted)<br>- Collaboration countertops<br>- Media 2101 Sills & ext. cabinet countertops | LG Hausys Hi-Macs        | GT909 Armadillo  |
|   |                          |  |
| <b>Bathroom Toilet Partition Door Colors</b>  | Scranton Products: Aria  | SCSBA  |
|   |                          |  |
| <b>Miscellaneous</b>  |                          |  |
| Tackboards  | Koroseal                 | Desert Sand w/Teflon;<br>WHITE 5851-02 Frame:<br>Sky White               |
| Cushion Seat  | Silica; Pattern: Scout   | SCSBA  |
| Window Sills  | LG Hausys Hi-Macs        | W101 Frostine  |
| Lighting & Controls Switches  |                          | White  |
| All Electrical outlets  |                          | Gray   |
| All Outlet & Device Coverplates   |                          | Stainless Steel  |
| Exterior Speakers   |                          | To match adjacent block  |
| Horn / Strobe   |                          | White  |
| Interior Speakers   |                          | To match adjacent surface  |
| Sealant   |                          | SCSBA; Selection to be made for each condition by sample application in  |

|   |                        |  |
|---|------------------------|--|
|   |                        | field                                  |
| Stage Main Curtain and Valance              |                        | SCSBA                                  |
| Stage Backdrop Curtains                     |                        | Black                                  |
| Accordion Panel Door                        | Modernfold             | 059 Black Nickel                       |
| Signage body color                          | Match SW Paint         | 7019 Gauntlet Gray                     |
| Signage text, graphic, symbol color         |                        | White                                  |
| Fire Extinguisher Cabinet                   |                        | match wall color                       |
| Basketball Backboard Edge Pad               | ADP Lemco              | Gray                                   |
| General Metal of Gym Equipment              |                        | Gloss White                            |
| Motorized Roll-up Shade in Gym              | Skyco                  | SCSBA                                  |
| Rubber Surfacing at outside play area       |                        | SCSBA                                  |
| Flagpole                                    |                        | Clear Anodized                         |
| Exterior speakers, transformer, CT cans     |                        | painted to match adjacent wall surface |
| Steel roof ladders                          |                        | painted to match adjacent Masonry      |
| Exterior Sign                               |                        | ANODIZED ALUMINUM                      |
| Changing Table Fabric                       | Maharam – Ledger       | SCSBA                                  |
| Book carts                                  |                        | Aluminum                               |
| Bike Racks                                  |                        | Silver                                 |
| Ext Louvers in Horizontal Metal Panel       | Match Horizontal Metal | Match Metal Panel                      |
| Ext Louvers in CMU                          | Match PPG              | PPG14-14 Summer Suede                  |
| TDD Grilles/Radiators on CMU                | Match PPG              | PPG14-14 Summer Suede                  |
| TDD Grilles/Radiators on 6x24 Tile          | Match Sherwin Williams | SW 7042                                |
| Grilles in Media Millwork Toe Kick          | MFR Standard           | DB Simulated Anodized Dark Bronze      |
| Finn Tube Grilles in Solid Surface Counters | MFR Standard           | DB Simulated Anodized Dark Bronze      |
| Finn Tube Grilles in P-lam Countertops      | MFR Standard           | DB Simulated Anodized Dark Bronze      |
| Grilles in Classroom Millwork Toe Kick      | MFR Standard           | DB Simulated Anodized Dark Bronze      |
| Radiators on 3x6 Bathroom Tile              | MFR Standard           | White                                  |
| TDD Grilles/Radiators on Gyp/MDF Typical    | Match wall color       | See Paint Section                      |
| Panel Radiators @ Dining/Commons            | Match Sherwin Williams | CSBA                                   |

**Commented [BB1]:** Radiant Panels: Standard white at General Paint ; GRDs: Price color B-12 'Standard White' at General Paint



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## SECTION 09 2216

### NON-STRUCTURAL METAL FRAMING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes non-load-bearing steel framing members for the following applications:
  - 1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
  - 2. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).
- B. Related Sections include the following:
  - 1. Section 07 2100 "Thermal Insulation" for insulation installed in between framing members.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.

##### 1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Design framing systems in accordance with American Iron and Steel Institute Publication "S220 - North American Specification for the Design of Cold-Formed Steel Framing - Nonstructural Members", except as otherwise shown or specified.
- D. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Framing Industry Association (SFIA) or be a part of a similar organization that provides verifiable code compliance program.

##### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI's "Code of Standard Practice".

## PART 2 - PRODUCTS

### 2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

- A. Framing Members, General: Comply with ASTM C 645 for conditions indicated.
  - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
  - 2. Protective Coating: ASTM A 653, G40, Coating with equivalent corrosion resistance of ASTM A 653, G40 or [DiamondPlus®](#) coating; roll-formed from steel meeting mechanical and chemical requirements of ASTM A 1003 with a zinc-based coating. [G60]. Galvannealed products are not acceptable.
    - a. Coatings shall demonstrate equivalent corrosion resistance with an evaluation report acceptable to the authorities having jurisdiction.
- B. Embossed Steel Studs and Tracks: Studs which have been roll-formed and embossed with surface deformations to stiffen the framing members ("Viper" studs, etc.) shall **not** be used on this Project.

### 2.2 SUSPENSION SYSTEM COMPONENTS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 16 gauge (0.0625-inch-) diameter wire, or double strand of 18 gauge (0.0475-inch) diameter wire.
- B. Hanger Attachments to Concrete:
  - 1. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.
- D. Flat Hangers: Steel sheet, minimum 1 by 3/16 inch by length indicated.
- E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-steel thickness of 16 gauge (0.0538 inch) and minimum 1/2-inch- wide flanges.
  - 1. Depth: Minimum 1-1/2 inches.
- F. Furring Channels (Furring Members):
  - 1. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
    - a. Minimum Base Steel Thickness: Minimum 20 gauge (0.0296 inch).
  - 2. Resilient Furring Channels: 1/2-inch- deep members designed to reduce sound transmission.
    - a. Equal to: [RC Deluxe \(RCSD\) Resilient Channel](#) by ClarkDietrich Building Systems or RSIC-1 as manufactured by PAC International, Inc.
- G. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Armstrong World Industries, Inc.; Drywall Grid Systems.
    - b. Chicago Metallic Corporation.
    - c. USG Corporation; Drywall Suspension System.

## 2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

- A. Steel Studs and Runners: ASTM C 645.
1. Minimum Base-Steel Thickness: Minimum 20 gauge (30 mil or 0.0296 inch).
- B. Slip-Type Head Joints:
1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
    - a. Available Products: Subject to compliance with requirements of Contract Documents, products that may be incorporated into the Work include, but are not limited to, the following:
      - 1) Steel Network Inc. (The); VertiClip SLD/VertiTrack VTD Series.
      - 2) ClarkDietrich Building Systems; [BlazeFrame DSL](#) [MaxTrak](#) Slotted Track.
- C. Backing Plate: Proprietary fire-retardant-treated wood blocking and bracing in width indicated.
1. Product: ClarkDietrich Building Systems; [Danback Fire-Retardant Treated Wood Backing Plate](#) [D16F] [D24F], or a comparable product.
- D. Flat Strap Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Steel Thickness: Minimum 16 gauge.
- E. Cold-Rolled Channel Bridging: 16 gauge base-steel thickness, with minimum 1/2-inch wide flanges.
1. Product: ClarkDietrich Building Systems; [Cold-Formed U-Channel](#) and [EasyClip U-Series Angle](#) [U543] [U545] [U547], or a comparable product.
  2. Depth: Minimum 1-1/2 inches.
  3. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 16 gauge (0.0538 inch) thick, galvanized steel.
- F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Minimum Base Steel Thickness: Minimum 20 Gauge (0.0296 inch).
  2. Depth: 7/8 inch.
- G. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.
1. Equal to: [RC Deluxe \(RCSD\) Resilient Channel](#) by ClarkDietrich Building Systems, or RSIC-1 as manufactured by PAC International, Inc.
- H. Cold-Rolled Furring Channels: 16 gauge (0.0538 inch) base-steel thickness, with minimum 1/2-inch- wide flanges.
1. Depth: Minimum 3/4 inch.
  2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum base-steel thickness of 20 gauge (0.0296 inch).
  3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062 inch diameter wire, or double strand of 0.0475-inch- diameter wire.
- I. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches wall attachment flange of 3/4 inch, minimum base-steel thickness of 25 gauge (0.0179 inch), and depth required to fit insulation thickness indicated.

## 2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
  - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
  
- B. Sill Sealer for Exterior Steel Stud Walls:
  - 1. Basis of Design: Contract Documents are based on product of manufacturer listed below to establish a standard of quality. Other available manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
    - a. Manufacturer: Protecto Wrap; [www.protectowrap.com](http://www.protectowrap.com)
    - b. Product: Premium Energy Sill Sealer
  - 2. Description: 3/8 inch thick, aggressive rubberized adhesive membrane that forms an air/vapor moisture barrier system. The product is a black, opaque, sticky solid with a white or colored foam layer with no odor.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
  - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
  
- B. Blocking: Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, cabinets and casework, or similar construction.
  
- C. Bracing: Install bracing at terminations in assemblies.
  
- D. Expansion Joints: **Do not** bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

### 3.3 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.
  
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

- C. Suspend hangers from building structure as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
    - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
    - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
  - 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  - 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  - 5. Do not attach hangers to steel roof deck.
  - 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
  - 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
  - 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

### **3.4 INSTALLING FRAMED ASSEMBLIES**

- A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- B. Install studs so flanges within framing system point in same direction.
- C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
  - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.

2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
    - a. Install two studs at each jamb or provide 16 gauge studs at door openings, unless otherwise indicated.
    - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
  3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
  4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
  5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
  6. Curved Partitions:
    - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
    - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches o.c.
- D. Direct Furring:
1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches on center
- E. Z-Furring Members:
1. Erect insulation (specified in Division 7 Section "Building Insulation") vertically and hold in place with Z-furring members spaced 24 inches on center
  2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches on center
  3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

**END OF SECTION**

## SECTION 09 2900

### GYPSUM BOARD

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Interior gypsum board.
  - 2. Glass mat tile backing panels - interior.
  - 3. Aluminum reveals and trims.
- B. Related Sections include the following:
  - 1. Section 05 4200 "Cold-Formed Metal Framing" for load-bearing steel framing that supports gypsum board.
  - 2. Section 07 2100 "Thermal Insulation" for insulation and vapor retarders installed in assemblies that incorporate gypsum board.
  - 3. Section 07 9200 "Joint Sealants" for acoustical sealants installed in assemblies that incorporate gypsum board.
  - 4. Section 09 2216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board.
  - 5. Section 09 3013 "Ceramic Tile" for cementitious backer units installed as substrates for ceramic tile.
  - 6. Section 09 9100 "Painting" for primers applied to gypsum board surfaces.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For the following products:
  - 1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.

##### 1.4 QUALITY ASSURANCE

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

##### 1.5 STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.



## 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

## PART 2 - PRODUCTS

### 2.1 PANELS, GENERAL

- A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

### 2.2 INTERIOR GYPSUM BOARD

- A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
  - 1. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. American Gypsum Co.
    - b. Certainteed America Inc.
    - c. G-P Gypsum.
    - d. National Gypsum Company.
    - e. PABCO Gypsum.
    - f. USG Corporation.
- B. Type X:
  - 1. Thickness: 5/8 inch.
  - 2. Long Edges: Tapered.

### 2.3 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backer Units:
  - 1. Comply with ASTM C 1178/C 1178M.
  - 2. Available Products: Subject to compliance with requirements of Contract Documents, products which may be incorporated in the Work include, but are not limited to, the following:
    - a. "DensShield Tile Guard" by G-P Gypsum.
    - b. "Fiberock Aqua-Tough Interior Panel" by USG Corporation.
  - 3. Core: 5/8 inch, Type X.
  - 4. Provide glass-mat, water-resistant backing board where ever tile is applied to a stud wall.

## 2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
  - 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
  - 2. Shapes:
    - a. Cornerbead.
    - b. Bullnose bead.
    - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
    - d. L-Bead: L-shaped; exposed long flange receives joint compound.
    - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
    - f. Expansion (control) joint.
    - g. Curved-Edge Cornerbead: With notched or flexible flanges.
- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
  - 1. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Fry Reglet Corp.
    - b. Gordon, Inc.
    - c. Pittcon Industries.
  - 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
  - 3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.
  - 4. Trim Style: Fry Reglet: Reveal Molding #DRM-625-50, non-vented; clear anodized aluminum. Provide "X" and "T" intersections as shown on Drawings.

## 2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475.
- B. Joint Tape:
  - 1. Interior Gypsum Wallboard: Paper.
  - 2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
  - 3. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
  - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
  - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
  - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
  - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
- D. Joint Compound for Tile Backing Panels:
  - 1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

## 2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
  - 1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
  - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
  - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Acoustical Sealant: As specified in Division 7 Section "Joint Sealants."
- E. Thermal Insulation: As specified in Division 7 Section "Thermal Insulation."
- F. Vapor Retarder: As specified in Division 7 Section "Building Insulation."

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 APPLYING AND FINISHING PANELS, GENERAL**

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.

- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
  - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
  - 2. Fit gypsum panels around ducts, pipes, and conduits.
  - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

### **3.3 APPLYING INTERIOR GYPSUM BOARD**

- A. Install interior gypsum board in the following locations:
  - 1. Type X: Vertical surfaces, unless otherwise indicated.
- B. Single-Layer Application:
  - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
  - 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    - b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
  - 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
  - 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
  - 1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
  - 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
  - 3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
  - 4. Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.

- D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.
- E. Curved Surfaces:
  - 1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch- long straight sections at ends of curves and tangent to them.
  - 2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

### **3.4 APPLYING TILE BACKING PANELS**

- A. Glass-Mat, Water-Resistant Backing Panel: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch gap where panels abut other construction or penetrations.
- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

### **3.5 INSTALLING TRIM ACCESSORIES**

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
  - 1. Cornerbead: Use at outside corners, unless otherwise indicated.
  - 2. Bullnose Bead: Use where indicated.
  - 3. LC-Bead: Use at exposed panel edges.
  - 4. L-Bead: Use where indicated.
  - 5. U-Bead: Use at exposed panel edges.
  - 6. Curved-Edge Cornerbead: Use at curved openings.
- D. Aluminum Trim: Install in locations indicated on Drawings.
- E. Install corner beads at external corners. Provide metal trim to protect edge of gypsum board wherever gypsum board intersects a dissimilar material. Hold channel and L trim back from metal window and door frames 1/8 inch to allow for caulking.

### **3.6 FINISHING GYPSUM BOARD**

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below:
  - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
  - 2. Level 2: Panels that are substrate for tile and panels that are substrate for CMU wainscot.
  - 3. Level 3: Panels that are substrates for wall coverings and wall panels.
  - 4. Level 5: At panel surfaces that will be exposed to view, unless otherwise indicated.
    - a. Primer and its application to surfaces are specified in other Division 9 Sections.
- E. Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.

### **3.7 PROTECTION**

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

### **3.8 FIELD QUALITY CONTROL**

- A. Above-Ceiling Observation: Architect will conduct an above-ceiling observation before installing gypsum board ceilings and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
  - 1. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
  - 2. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:
    - a. Installation of 80 percent of lighting fixtures, powered for operation.
    - b. Installation, insulation, and leak and pressure testing of water piping systems.
    - c. Installation of air-duct systems.
    - d. Installation of air devices.
    - e. Installation of mechanical system control-air tubing.
    - f. Installation of ceiling support framing.

**END OF SECTION**

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## SECTION 09 3013

### CERAMIC TILING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Glazed wall tile.
  - 2. Wall accent tile.
  - 3. Porcelain floor and wall tile.
  - 4. Quarry tile.
  - 5. Waterproofing for tile installations
  - 6. Thresholds installed as part of tile installations.
- B. Related Sections include the following:
  - 1. Section 03 3000 "Cast-in-Place Concrete" for monolithic slab finishes specified for tile substrates.
  - 2. Section 07 9200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
  - 3. Section 09 0001 "Finish Schedule" for product selections and colors.
  - 4. Section 09 2900 "Gypsum Board" for tile backing panels installed in gypsum wallboard assemblies.

##### 1.3 DEFINITIONS

- A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.
- B. Facial Dimension: Nominal tile size as defined in ANSI A137.1.

##### 1.4 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
  - 1. Level Surfaces: Minimum 0.6.
- B. Load-Bearing Performance: **For** ceramic tile installed on walkway surfaces, provide installations rated for the following load-bearing performance level based on testing assemblies according to ASTM C 627 that are representative of those indicated for this Project:
  - 1. Heavy: Passes cycles 1 through 12.

##### 1.5 SUBMITTALS

- A. Product Data: For each type of tile, mortar, grout, and other products specified.



- B. Tile Samples for Selection: Manufacturer's color charts consisting of actual tiles or sections of tiles showing the full range of colors, textures, and patterns available for each type and composition of tile indicated. Include Samples of accessories involving color selection.
- C. Grout Samples for Selection: Manufacturer's color charts consisting of actual sections of grout showing the full range of colors available for each type of grout indicated.

## **1.6 QUALITY ASSURANCE**

- A. Installer Qualifications: Engage an experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Source Limitations for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties without delaying the Work.
- C. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.
- D. Source Limitations for Other Products: Obtain each of the following products specified in this Section from one source and by a single manufacturer for each product:
  - 1. Solid surface material thresholds.
  - 2. Waterproofing.

## **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.
- B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.
- C. Handle tile with temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

## **1.8 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are being maintained to comply with referenced standards and manufacturer's written instructions.

## **1.9 EXTRA MATERIALS**

- A. Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
  - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
  - 1. Tile Products:
    - a. American Olean Tile Company.
    - b. Daltile Corporation.
  - 2. Tile-Setting and -Grouting Materials:
    - a. Laticrete International, Inc.; [www.laticrete.com](http://www.laticrete.com)
    - b. Mapei Corporation; [www.mapei.us](http://www.mapei.us)
    - c. Custom Building Products; [www.custombuildingproducts.com](http://www.custombuildingproducts.com)

### **2.2 PRODUCTS, GENERAL**

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
  - 1. Provide tile complying with Standard Grade requirements, unless otherwise indicated.
  - 2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting Materials" and "Grouting Materials" articles.
- C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
  - 1. Provide Architect's selections from manufacturer's full range of colors, textures, and patterns for products of type indicated. Also see the Finish Schedule.
  - 2. Provide tile trim and accessories that match color and finish of adjoining flat tile.
- D. Factory Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples.
- E. Mounting: Where factory-mounted tile is required, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless another mounting method is indicated.
  - 1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for these kinds of installations and has a record of successful in-service performance.
- F. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating them with a continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

## 2.3 TILE PRODUCTS

- A. Glazed Ceramic Wall Tile:
1. Field Tile: Module size - 3 x 6 inches as indicated in the Finish Schedule or if not listed then as selected by the Architect from Price Group I.
  2. Accent tile: Module size - 3 x 6 inches as indicated in the Finish Schedule or if not listed then as selected by the Architect from Price Group IV or V.
  3. Thickness: 5/16 inch.
  4. Face: Plain with cushion edges.
  5. Mounting: Factory back-mounted.
  6. Colors: As listed in the Finish Schedule and shown on the drawings.
  7. Accents: Multiple colors and accents may be used, including deep colored units.
- B. Porcelain Floor and Wall Tile:
1. Composition: Porcelain.
  2. Module Size: 6 x 6 inches, 15 x 30 inches, and as indicated on Finish Schedule.
  3. Nominal Thickness: 5/16 inch.
  4. Face: Plain with square or cushion edges.
  5. Surface: Unpolished.
  6. Color: As listed in the Finish Schedule and as shown on drawings. If not indicated then as selected by the Architect from series indicated.
  7. Available Products:
    - a. As listed in the Finish Schedule.
- C. Quarry Tile
1. Composition: Clay.
  2. Module Size: 6 x 6 inches, and as indicated on Finish Schedule.
  3. Nominal Thickness: 1/2 inch.
  4. Face: Plain with square.
  5. Surface: Unpolished.
  6. Color: As listed in the Finish Schedule and as shown on Drawings. If not indicated then as selected by the Architect from series indicated.
- D. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with the following requirements:
1. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile where applicable.
  2. Shapes: As follows, selected from manufacturer's standard shapes:
    - a. Base for Portland Cement Mortar Installations: Coved.
    - b. Base for Thin-Set Mortar Installations: Straight.
    - c. Wainscot Cap for Thin-Set Mortar Installations: Surface bullnose.
    - d. External Corners for Thin-Set Mortar Installations: Surface bullnose.
    - e. Internal Corners: Field-buttet square corners, except with coved base and cap angle pieces designed to member with stretcher shapes.

## 2.4 WATERPROOFING FOR TILE INSTALLATIONS

- A. Basis of Design: Contract Documents are based on product specified below to establish a standard of quality. Other manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
1. Manufacturer: Noble Co.
  2. Product: Nobleseal TS.

- B. Polyethylene Sheet Waterproofing: Manufacturer's standard proprietary product complying with ANSI A118.10 and consisting of composite sheets, 60 inches wide by a nominal thickness of 0.030, composed of an inner layer of chlorinated polyethylene sheet faced on both sides with laminated high-strength nonwoven polyester material, designed for embedding in latex-Portland cement mortar, and as substrate for latex-Portland cement mortar setting bed.

## 2.5 FLUID APPLIED WATERPROOFING AND CRACK ISOLATION MEMBRANE

- A. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated into the Work include but are not limited to the following:
  - 1. Mer-Krete Hydro Guard 2000 a Division of Parexlaharba.
    - a. Provide a Type II synthetic reinforcement cloth.
- B. Properties:
  - 1. Elongation: 500 percent minimum.
  - 2. Porosity: Withstand a water head of 115 ft. for a period of sixty minutes without water transmission or rupture of the membrane.
  - c. Thickness: 30 mils, minimum
  - d. Elongation over crack: 0.22 inches (Split Slab Test).
  - e. Adhesion in shear: 250 psi or greater.
  - f. Tensile Strength: 450 psi
  - g. Tile Adhesion to Membrane (ANSI A118.4) method: Greater than 500 psi.
  - h. Freeze Thaw (250 cycles after cure): No Change (M/K A-223 ) method.
  - i. ICBO Listed and meet ANSI A-118.10 Standard.
  - j. Joint Backing: Closed cell polyethylene.
  - k. Sealant: Single or two component urethane per TCNA requirements.
  - l. For use at wet areas, such as showers, and where indicated on Drawings.

## 2.6 THRESHOLDS

- A. General: Provide thresholds that are uniform in color and finish, fabricated to sizes and profiles indicated to provide transition between tile surfaces and adjoining finished floor surfaces.
  - 1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.
- B. Molded Thresholds:
  - 1. Solid Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with the material and performance requirements of ANSI Z124.3, Type 5 or Type 6, without a precoated finish.
    - a. Thickness: 1/2 inch minimum.
    - b. Provide tapered front edge.
    - c. Thresholds shall be continuous between door jambs.
    - d. Provide colors as selected by Architect from manufacturer's full selection of colors.
    - e. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
      - 1) Corian; DuPont Polymers.
      - 2) Solid Surfacing; Formica Corporation.
      - 3) Staron; Lotte Chemicals

## 2.7 SETTING MATERIALS

- A. Latex-Portland Cement Mortar: ANSI A118.4, composed as follows:
1. Mixture of Dry-Mortar Mix and Latex Additive: Mixture of prepackaged dry-mortar mix and liquid-latex additive complying with the following requirements:
    - a. Basis of Design: Laticrete 3701 or Mapei Kerabond/Keralastic.
    - b. Latex Additive: Styrene butadiene rubber.
    - c. For wall applications, provide nonsagging, latex-Portland cement mortar complying with ANSI A118.4 for mortar of this type defined in Section F-2.1.2.
    - d. Protection:
      - 1) Install only at temperatures between 40 degrees F and 95 degrees F.
      - 2) Protect from traffic for 24 hours. Protect from heavy traffic for 7 days.
      - 3) Protect from frost and rain for 21 days.
      - 4) Protect from water immersion for 21 days.

## 2.8 GROUTING MATERIALS

- A. Latex-Portland Cement Grout: ANSI A118.6 for materials described in Section H-2.4, composed as follows:
1. Mixture of Dry-Grout Mix and Latex Additive: Mixture of factory-prepared, dry-grout mix and latex additive complying with the following requirements:
    - a. Unsanded Dry-Grout Mix: Dry-set grout complying with ANSI A118.6 and ISO CG2WA (cementitious grout (CG), improved (2), with reduced water absorption (W) and high abrasion resistance (A)), for joints 1/8 inch and narrower.
      - 1) Basis of Design: Mapei "Keracolor U".
      - 2) Stain Resistant Additive: Mapei "Grout Maximizer" in lieu of water as recommended by manufacturer.
      - 3) Protection:
        - (a) Use only at temperatures between 50 degrees F and 100 degrees F.
        - (b) At showers and tub surrounds, restrict use for 48 hours; at steam showers, restrict use for 14 days.
        - (c) Keep installation from immersion in water and protect from rain and freezing for at least 21 days after completion.
        - (d) Floors: Keep free from heavy traffic for at least 3 hours after grouting.
        - (e) Walls: Protect from impact, vibration, and hammering on adjacent and opposite walls for 14 days after tile installation.
        - (f) Allow for extended periods of cure and protection when temperatures drop below 60 degrees F or when the relative humidity is higher than 70 percent.
    - b. Sanded Dry-Grout Mix: Commercial Portland cement grout complying with ANSI A118.6 and ISO CG2WA (cementitious grout (CG), improved (2), with reduced water absorption (W) and high abrasion resistance (A)), for joints 1/8 inch and wider.
      - 1) Basis of Design: Mapei "Keracolor S".
      - 2) Stain Resistant Additive: "Grout Maximizer" in lieu of water (or as recommended by grout manufacturer).

- 3) Protection:
    - (a) Use only at temperatures between 50 degrees F and 100 degrees F.
    - (b) At showers and tub surrounds, restrict use for 48 hours; at steam showers, restrict use for 14 days.
    - (c) Keep installation from immersion in water and protect from rain and freezing for at least 21 days after completion.
    - (d) Floors: Keep free from heavy traffic for at least 3 hours after grouting.
    - (e) Walls: Protect from impact, vibration, and hammering on adjacent and opposite walls for 14 days after tile installation.
    - (f) Allow for extended periods of cure and protection when temperatures drop below 60 degrees F or when the relative humidity is higher than 70 percent.
  - c. Colors: As selected by Architect from manufacturer's full range of colors.
- B. Epoxy Grout: Meets ANSI A118.3, conforms to ISO 13007 classification to R2/RG.
1. Basis of Design: Contract Documents are based on product specified below to establish a standard of quality. Other manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
    - a. Manufacturer: Mapei.
    - b. Product: KerapoxyCQ.
  2. Properties: Two-component, 100 percent solids, stain and chemical resistant quartz aggregate formulation.
    - a. Compressive Strength (at 28 days): 6,525 psi.
    - b. Chemically resistant per ASTM C267.
    - c. Protection:
      - 1) Use only at temperatures between 60 degrees F and 90 degrees F.
      - 2) Protect from traffic for 7 days.
      - 3) Protect from water exposure for 14 days, minimum.
      - 4) Allow for extended periods of cure and protection when temperature is below 73 degrees F.
    3. Use in wet areas, Kitchen areas, and locations as determined by Architect.
    4. Colors: As indicated on Key-Finish Schedule and as selected by Architect from manufacturer's full range of colors.

## 2.9 ELASTOMERIC SEALANTS

- A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements of Division 7 Section "Joint Sealants."
- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.
- C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes.

- D. Multipart, Pourable Urethane Sealant for Use T: ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.
- E. Available Products: Subject to compliance with requirements of Contract Documents, products which may be incorporated into the Work include, but are not limited to, the following:
  - 1. One-Part, Mildew-Resistant Silicone Sealants:
    - a. Dow Corning 786; Dow Corning Corporation.
    - b. Sanitary 1700; GE Silicones.
    - c. Pecora 898 Sanitary Silicone Sealant; Pecora Corp.
    - d. Tremsil 600 White; Tremco, Inc.
  - 2. Multipart, Pourable Urethane Sealants:
    - a. Chem-Calk 550; Bostik.
    - b. Vulkem 245; Mameco International, Inc.
    - c. NR-200 Urexpan; Pecora Corp.
    - d. THC-900; Tremco, Inc.

## 2.10 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, Portland-cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: White-zinc-alloy terrazzo strips, 1/8 inch wide at top edge with integral provision for anchorage to mortar bed or substrate, unless otherwise indicated.
- C. Temporary Protective Coating: Provide product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; is compatible with tile, mortar, and grout products; and is easily removable after grouting is completed without damaging grout or tile.
  - 1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 degrees F per ASTM D 87.
- D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- E. Grout Sealer: Solvent-based, no-sheen, natural-look penetrating sealer for all sanded and non-sanded grout joints.

## 2.11 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials and additives in accurate proportions. Do not use or add any water to mortar or grout when mixing, use only latex additive.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
  - 1. Verify that substrates for setting tile are firm; dry; clean; free from oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 series of tile installation standards for installations indicated.
  - 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
  - 3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust latter in consultation with Architect.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Remove coatings, including curing compounds, and other substances that contain soap, wax, oil, or silicone and are incompatible with tile-setting materials by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.
- B. Provide concrete substrates for tile floors installed with dry-set or latex-portland cement mortars that comply with flatness tolerances specified in referenced ANSI A108 series of tile installation standards for installations indicated.
  - 1. Use trowelable leveling and patching compounds per tile-setting material manufacturer's written instructions to fill cracks, holes, and depressions.
  - 2. Remove protrusions, bumps, and ridges by sanding or grinding.
- C. Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, verify that tile has been blended in the factory and packaged so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- D. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent adhesion or staining of exposed tile surfaces by grout, protect exposed surfaces of tile against adherence of mortar and grout by precoating them with a continuous film of temporary protective coating indicated below, taking care not to coat unexposed tile surfaces:
  - 1. Petroleum paraffin wax, applied hot.

### **3.3 INSTALLATION, GENERAL**

- A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 series of tile installation standards in "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.
- B. TCNA Installation Guidelines: TCNA's "Handbook for Ceramic Tile Installation." Comply with TCNA installation methods indicated in ceramic tile installation schedules.



- C. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are the same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
  - 1. For tile mounted in sheets, make joints between tile sheets the same width as joints within tile sheets so joints between sheets are not apparent in finished work.
- F. Lay out tile wainscots to next full tile beyond dimensions indicated.
- G. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated or if not indicated as recommended by TCNA guidelines, during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
  - 1. Locate joints in tile surfaces directly above joints in concrete substrates.
  - 2. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealants."
- H. Grout tile to comply with the requirements of the following tile installation standards:
  - 1. For ceramic tile grouts (sand-Portland cement, dry-set, commercial Portland cement, and latex-Portland cement grouts), comply with ANSI A108.10.

### 3.4 FLOOR TILE INSTALLATION

- A. General: Install tile to comply with requirements in the Ceramic Tile Floor Installation Schedule, including those referencing TCNA (latest edition) for installation methods and ANSI A108 series of tile installation standards.
  - 1. Movement Joints: Provide movement joints as recommended by TCNA EJ171 Latest Edition "Movement Joint Design Essentials". Space joints as indicated on the drawings, if not shown on the drawings space joints as recommended by TCNA guidelines. Coordinate with the Architect for precise location of joints, locate joints as follows:
    - a. Interior: Space joints not greater than 20 feet in each direction interior spaces.
    - b. Exterior or interior exposed to direct sunlight: Space joints not greater than 8 feet in each direction.
    - c. Provide joints where tilework abuts restraining surfaces such as perimeter walls, dissimilar floors, curbs, columns, pipes, ceilings and where changes occur in backing materials. Not at drain strainers.
    - d. Provide joints where the following conditions exist: at all expansion, control, construction, cold and seismic joints, including such conditions at vertical surfaces.
  - 2. Installation Methods:
    - a. Tile over Concrete Surfaces in Shower Areas: TCNA F122 (latest edition).
      - 1) Waterproof membrane meeting ANSI A118.10.
      - 2) Mortar meeting ANSI A108.1A.
    - b. Tile over Concrete Surfaces: TCNA F125A (latest edition).

- B. Joint Widths: Install tile on floors with the following joint widths:
  - 1. Ceramic Mosaic Tile: 1/16 inch.
  - 2. Ceramic Tile: 1/16 inch.
- C. Back Buttering: For installations indicated, obtain 100 percent mortar coverage by complying with applicable special requirements for back buttering of tile in referenced ANSI A108 series of tile installation standards:
  - 1. Tile floors composed of tiles 8 by 8 inches or larger.
  - 2. Tile floors installed with chemical-resistant grouts.
- D. Solid Surface Thresholds: Install solid surface thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.
  - 1. Set thresholds in latex-Portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent non-tile floor finish.
- E. Apply two (2) coats of grout sealer in accordance with manufacturer's printed instructions and recommendations. Remove sealer remaining on the tile within 3 to 5 minutes of application.

### **3.5 WALL TILE INSTALLATION**

- A. Install types of tile designated for wall installations to comply with requirements in the Ceramic Tile Wall Installation Schedule, including those referencing TCNA installation methods and ANSI setting-bed standards.
  - 1. Installation Methods:
    - a. Tile over Masonry Surfaces: TCNA W211 (latest edition).
    - b. Tile over glass mat tile backer panels - Interior Surfaces: TCNA W244C (latest edition).
    - c. Tile for Showers: TCNA B431 - (latest edition).
- B. Joint Widths: Install tile on walls with the following joint widths:
  - 1. Ceramic Tile: 1/16 inch.
  - 2. Wall Tile: 1/16 inch.
- C. Back Buttering: For installations indicated, obtain 100 percent mortar coverage by complying with applicable special requirements for back buttering of tile in referenced ANSI A108 series of tile installation standards:
  - 1. Tile wall installations in wet areas, including showers.
  - 2. Tile wall installations composed of tiles 8 by 8 inches or larger.
- D. Apply two (2) coats of grout sealer in accordance with manufacturer's printed instructions and recommendations. Remove sealer remaining on the tile within 3 to 5 minutes of application.

### **3.6 CLEANING AND PROTECTING**

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
  - 1. Remove latex-Portland cement grout residue from tile as soon as possible.
  - 2. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.

3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to brick and grout manufacturer. Trap and remove coating to prevent it from clogging drains.
- B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.
- C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, which ensure tile is without damage or deterioration at the time of Substantial Completion.
- D. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
- E. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.
- F. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

**END OF SECTION**

## SECTION 09 5113

### ACOUSTICAL PANEL CEILINGS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

##### 1.2 SUMMARY

- A. Section includes acoustical ceiling panels (mineral fiber and wood), suspension system and accessories.
- B. Related Sections:
  - 1. Section 09 2900 "Gypsum Board" for suspension systems for gypsum board ceilings and soffits.

##### 1.3 SUBMITTALS

- A. Product Data: Manufacturer's product specifications and installation instructions for each acoustical ceiling material required, and for each suspension system, including certified laboratory test reports and other data as required to show compliance with these specifications.
  - 1. Include manufacturer's recommendations for cleaning and refinishing acoustical units, including precautions against materials and methods which may be detrimental to finishes and acoustical performances.
  - 2. Furnish ICC-ES reports for seismic systems.
- B. Samples: Set of 6 inch x 4 inch square samples for each acoustical unit required, showing full range of exposed color and texture to be expected in completed work.
  - 1. Set of 12-inch long samples of each exposed runner and molding.

##### 1.4 QUALITY ASSURANCE

- A. Source Limitations:
  - 1. Acoustical Ceiling Panel: Obtain each type through one source from a single manufacturer.
  - 2. Suspension System: Obtain each type through one source from a single manufacturer.
- B. Fire Performance Characteristics: Provide acoustical ceiling components that are identical to those tested for the following fire performance characteristics, according to ASTM test method indicated, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate marking of applicable testing and inspecting agency.
  - 1. Surface Burning Characteristics: As follows, tested per ASTM E 84.
    - a. Flame Spread: 25 or less.
    - b. Smoke Developed: 50 or less.
  - 2. Fire Resistance Ratings: As indicated by reference to design designation in UL "Fire Resistance Directory" or "FM Approval Guide", for floor, roof or beam assemblies in which acoustical ceilings function as a fire protective membrane; tested per ASTM E 119. Provide protection materials for lighting fixtures and air ducts to comply with requirements indicated for rated assembly.

- C. Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:
  - 1. CISCA's Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA's "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies--Seismic Zones 3 & 4."
- D. Coordination of Work: Coordinate layout and installation of acoustical ceiling units and suspension system components with other work supported by or penetrating through, ceilings, including light fixtures, HVAC equipment, fire-suppression system components (if any), and partition system (if any).

#### **1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination or other causes.
- B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

#### **1.5 PROJECT CONDITIONS**

- A. Space Enclosure: Do not install interior acoustical ceilings until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings completed, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy

#### **1.6 COORDINATION**

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire suppression system, and partition assemblies

#### **1.7 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Acoustical Ceiling Panels: Full-size equal to 2.0 percent of quantity installed.
  - 2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.
  - 3. Hold-Down Clips: Equal to 2.0 percent of amount installed.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER

- A. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following
1. Suspension System:
    - a. Armstrong.
    - b. Rockfon.
    - c. USG Donn Corp.
    - d. National Rolling Mills, Inc.
  2. Acoustical Tile:
    - a. Armstrong.
    - b. Certain Teed.
    - c. USG.
  3. Acoustical Sealant:
    - a. Tremco Acoustical Sealant; Tremco.
    - b. USG Acoustical Sealant; United States Gypsum Co.
    - c. Chem-Calk 600; Woodmont Products, Inc.
    - d. Pecora Corp; AC 20 FTR Acoustical and Insulation Sealant

### 2.2 MATERIALS

- A. Acoustical Ceiling Units:
1. General: Provide manufacturer's standard units of configuration indicated which are prepared for mounting method designated and which comply with FS SS-S-118 requirements, including those indicated by reference to type, form, pattern, grade (NRC or NIC's as applicable), light reflectance coefficient (LR), edge detail, and joint detail (if any).
  2. Mounting Method for Measuring NRC: No. 7 (mechanically mounted on special metal support), FS SS-S-118; or Type E-400 mounting as per ASTM E 795.
  3. Sound Attenuation Performance: Provide acoustical ceiling units with ratings for ceiling sound transmission class (STC) of range indicated as determined according to AMA 1-II "Ceiling Sound Transmission Test by Two-Room Method" with ceilings continuous at partitions and supported by a metal suspension system of type appropriate for ceiling unit of configuration indicated (concealed for tile, exposed for panels).
- B. Ceiling Types: Products listed below reflect Basis of Design selections.
1. Type 'A': Armstrong: Cirrus Second Look II (513)
    - a. Size: 24 inch x 48 inch x 3/4 inch.
    - b. Pattern: 24 inch x 24 inch squares
    - c. Edge: Beveled tegular lay-in (15/16 inch grid)
    - d. CAC: 35
    - e. LR: 0.85.
    - f. NRC: 0.65
    - g. ASTM E 1284 Classification: Type III, Form 1, Pattern E I K.
    - h. Surface finish: Factory-applied vinyl latex paint.
    - i. Color: White.
  2. Type 'B': Armstrong: 'Cirrus' Square Lay-In (574)
    - a. Size: 24 inch x 48 inch x 3/4 inch
    - b. Edge: Square Lay-in.
    - c. CAC: 35
    - d. LR: 0.86
    - e. NRC: 0.70 - Required for LEED for Schools rating.

- f. Recycled Content: Up to 80 percent.
  - g. ASTM E 1284 Classification: Type III, Form 1, Pattern E I.
  - h. Surface Finish: Factory-applied latex paint
  - i. Color: White.
3. Types 'C' and 'D': Gypsum Board (Refer to Section 09 2900 "Gypsum Board" and Section 09 9100 "Painting").
  4. Type 'E': Exposed construction (Refer to Section 09 9100 "Painting").
  5. Type 'F': Same as Type 'A' except with hold-down clips.
  6. Type 'G': Armstrong: Non-perforated Clean Room VL (870)
    - a. Size: 24 inch x 48 inch x 5/8 inch.
    - b. Edge: Square cut lay-in.
    - c. CAC: 40-44.
    - d. LR: 0.80
    - e. NRC: 0.05 - 0.15.
    - f. Surface Finish: Vinyl-faced membrane.
  7. Type 'H': Armstrong: WOODWORKS Linear – Solid Wood Panels
    - a. Planks: 5-1/4 inch wide; 12 inch x 96 inch x 3/4 inch panels
    - b. Material: Solid poplar, stained to "Light Cherry" #GLC
    - c. Suspension System: Prelude XL, black.
    - d. Acoustic Treatment: BioAcoustic Infill Panels installed above ceiling.
  8. Type 'I': Metal exterior soffit (Refer to Section 07 4293 "Metal Soffit Panels")
  9. Type 'J': Sprayed cellulose insulation - white (Refer to Section 07 2129 "Spray-Applied Acoustic Insulation.")

C. Metal Suspension System: Provide metal suspension systems of type, structural classification and finish indicated which comply with applicable ASTM C 635 requirements.

1. Finishes and Colors: Provide manufacturer's standard finish for type of system indicated, unless otherwise required. For exposed suspension members and accessories with painted finish, provide color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's full range of standard colors.
2. Attachment Devices: Size for 5 times design load indicated in ASTM C 635, Table 1, Direct Hung.
3. Hanger Wire: Galvanized carbon steel wire, ASTM A 641, soft temper, pre-stretched, Class 1 coating, sized so that stress at 3- times hanger design load (ASTM C 635, Table 1, Direct Hung), will be less than yield stress of wire, but provide not less than 12 gage.
4. Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.
  - a. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
  - b. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
  - c. Provide shadow reveal molding with width of reveal equal to depth of reveal.
5. Hold-Down Clips: Minimum 24 gauge spring steel, 1-7/16 inches deep x 7/8 inches wide, designed to fit over cross tees. Provide clips spaced symmetrically 2 ft. on center.

6. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces. Struts will be required at 12 feet on center both ways for all suspended ceilings according to UBC Standard 25-2.
    - a. In lieu of compression struts provide a seismic clip with an ES Report number from ICC demonstrating that the compression struts and the 2-inch perimeter wall mold are not required. Available products include, but are not limited to:
      - 1) BERC seismic clips; Armstrong.
      - 2) 1496 Perimeter Clip; Chicago Metallic Corp.
      - 3) ACM-7 clip; USG.
  7. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, pre-painted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 (Z90) coating designation, with pre-finished 15/16-inch- (24-mm-) wide metal caps on flanges.
    - a. Structural Classification: Heavy-duty system.
    - b. End Condition of Cross Runners: Butt-edge type.
    - c. Face Design: Flat, flush.
    - d. Cap Material: Steel or aluminum cold-rolled sheet.
    - e. Cap Finish: Painted in color as selected from manufacturer's full range.
    - f. Equal to Armstrong Prelude XL 15/16 inch Exposed Tee.
- D. Miscellaneous Materials:
1. Acoustical Sealant: Resilient, non-staining, non-shrinking, non-hardening, non-skinning, non-drying, non-sag sealant intended for interior sealing of concealed construction joints.
  2. Edge Trim: USG Ceilings "Compasso"; Armstrong "Axiom", or equivalent as judged by Architect.
    - a. Trim Height: 4 inch.
    - b. Finish: As selected by Architect from manufacturer's full range of custom colors.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Coordination: Furnish layouts for inserts, clips, or other supports required to be installed by other trades for support of acoustical ceilings.
  1. Furnish concrete inserts, steel deck hanger clips and similar devices to other trades for installation well in advance of time needed for coordination of other work.
- B. Layout: Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half width units at borders, and comply with reflected ceiling plans wherever possible.

### 3.2 INSTALLATION

- A. General: Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations, fire resistance rating requirements as indicated, and industry standards applicable to work.
- B. Arrange acoustical **units** and orient directionally-patterned units (if any) in manner shown by reflected ceiling plans.
  1. Install tile with pattern running in one direction.



- C. Install suspension systems to comply with ASTM C 636, with hangers supported only from building structural members. Locate hangers not less than 6 inch from each end and spaced 4'-0" along each carrying channel or direct-hung runner, unless otherwise indicated, leveling to tolerance of 1/8 inch in 12'-0". Comply with detail on drawings for seismic bracing.
- D. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye-screws, or other devices which are secure and appropriate for substrate, and which will not deteriorate or fail with age or elevated temperatures.
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum which are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing, countersplaying or other equally effective means.
- E. Install edge moldings of type indicated at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units.
  - 1. Screw-attach moldings to substrate at intervals not over 16 inch o.c. and not more than 3 inch from ends, leveling with ceiling suspension system to tolerance of 1/8 inch in 12'-0". Miter corners accurately and connect securely.
- F. Install acoustical panels in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders and at penetrations.
  - 1. Paint cut and exposed edges of acoustical tile.
  - 2. Install hold-down clips in areas indicated, and in areas where required by governing regulations or for fire-resistance ratings; space as recommended by panel manufacturer, unless otherwise indicated or required.

### **3.3 ADJUST AND CLEAN**

- A. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

**END OF SECTION**

## SECTION 09 6513

### RESILIENT BASE AND ACCESSORIES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Resilient wall base and accessories.
- B. Related Sections:
  - 1. Section 09 0000 "Finish Schedule" for color and pattern selections.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Samples for Verification: Full-size units of each color and pattern of resilient floor tile required.
  - 1. Resilient Wall Base and Accessories: Manufacturer's standard-size Samples, but not less than 12 inches long, of each resilient product color and pattern required.
- D. Maintenance Data: For resilient products to include in maintenance manuals.

##### 1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide products identical to those tested for fire-exposure behavior per test method indicated by a testing and inspecting agency acceptable to authorities having jurisdiction.

##### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 degrees F or more than 90 degrees F. Store tiles on flat surfaces.

##### 1.6 PROJECT CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer, but not less than 70 degrees F or more than 95 degrees F, in spaces to receive floor tile during the following time periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.

- B. After post-installation period, maintain temperatures within range recommended by manufacturer, but not less than 55 degrees F or more than 95 degrees F.
- C. Close spaces to traffic during floor covering installation.
- D. Close spaces to traffic for 48 hours after floor covering installation.
- E. Install resilient products after other finishing operations, including painting, have been completed.

## 1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.
  - 2. Resilient Wall Base and Accessories: Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

## PART 2 - PRODUCTS

### 2.1 COLORS AND PATTERNS

- A. Colors and Patterns: As listed in the Color Schedule or, if not listed, as selected by Architect from manufacturer's full range of colors and textures.

### 2.2 RESILIENT WALL BASE

- A. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers with products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Armstrong World Industries, Inc.; [www.armstrong.com](http://www.armstrong.com)
  - 2. Burke Mercer Flooring Products, Division of Burke Industries, Inc.; [www.burkeflooring.com](http://www.burkeflooring.com).
  - 3. Johnsonite, Inc., a Tarkett Company; [www.johnsonite.com](http://www.johnsonite.com)
  - 4. FLEXCO; [www.flexcofloors.com](http://www.flexcofloors.com)
  - 5. Roppe Corporation; [www.roppe.com](http://www.roppe.com).
- B. Characteristics - ASTM F 1861
  - 1. Type (Material Requirement): TP (rubber, thermoplastic).
  - 2. Group (Manufacturing Method): I (solid, homogeneous).
  - 3. Style: Coved.
  - 4. Minimum Thickness: 0.125 inch.
  - 5. Height: 4 inches.
  - 6. Lengths: Coils in manufacturer's standard length.
  - 7. Outside Corners: Pre-molded.
  - 8. Inside Corners: None.
  - 9. Surface: Smooth.

## 2.4 RESILIENT MOLDING ACCESSORY

- A. Applications, including but not limited to: Carpet bar for tackless installations, carpet edge for glue-down applications, nosing for carpet, nosing for resilient floor covering, reducer strip for resilient floor covering, and joiner for tile and carpet.
- B. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers with products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Burke Mercer Flooring Products, Division of Burke Industries, Inc.; [www.burkeflooring.com](http://www.burkeflooring.com).
  - 2. Johnsonite, Inc., a Tarkett Company; [www.johnsonite.com](http://www.johnsonite.com)
  - 3. FLEXCO; [www.flexcofloors.com](http://www.flexcofloors.com)
  - 4. Roppe Corporation; [www.roppe.com](http://www.roppe.com).
- C. Material: Rubber, to match wall base.

## 2.5 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.
  - 1. Verify finishes of substrates comply with tolerances and other requirements specified in other Sections and substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
  - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
  - 3. Moisture Testing:
    - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    - b. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

- C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- E. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
  - 1. Do not install resilient products until they are same temperature as space where they are to be installed.
- F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.3 RESILIENT WALL BASE INSTALLATION**

- A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- D. Do not stretch wall base during installation.
- E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.
- F. Pre-molded Corners: Install pre-molded corners before installing straight pieces.

### **3.5 RESILIENT ACCESSORY INSTALLATION**

- A. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor coverings that would otherwise be exposed.

### **3.6 CLEANING AND PROTECTION**

- A. Perform the following operations immediately after completing resilient product installation:
  - 1. Remove adhesive and other blemishes from exposed surfaces.
  - 2. Sweep and vacuum surfaces thoroughly.
  - 3. Damp-mop surfaces to remove marks and soil.
    - a. Do not wash surfaces until after time period recommended by manufacturer.

- B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacture

**END OF SECTION**

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## SECTION 09 6566

### RESILIENT ATHLETIC FLOORING

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Sheet vinyl athletic flooring.
- B. Related Requirements:
  - 1. Section 096513 "Resilient Base and Accessories" for wall base and accessories installed with resilient athletic flooring.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show installation details and locations of the following:
  - 1. Floor patterns.
  - 2. Layout, colors, widths, and dimensions of game lines and markers.
  - 3. Seam locations for sheet flooring.
- C. Samples: For each exposed product and for each type, color, and pattern specified, 6-inch-square in size and of the same thickness indicated for the Work.
  - 1. Game-Line- and Marker-Paint Samples: Include Sample sets showing game-line- and marker-paint colors applied to flooring.
  - 2. Seam Samples: For each vinyl sheet flooring color and pattern required; with seam running lengthwise and in center of 6-by-9-inch Sample applied to a rigid backing and prepared by Installer for this Project.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For sheet vinyl flooring Installer.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For resilient athletic flooring to include in maintenance manuals.

#### 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.



1. Sheet Flooring: Furnish full-width rolls of not less than 10 linear feet for each 500 linear feet or fraction thereof, of each type, color, and pattern of flooring installed.

## **1.7 QUALITY ASSURANCE**

- A. Sheet Vinyl Flooring Installer Qualifications: An experienced installer who has completed sheet vinyl flooring installations using seaming methods indicated for this Project and similar in material, design, and extent to that indicated for this Project; who is acceptable to manufacturer; and whose work has resulted in installations with a record of successful in-service performance.

## **1.8 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storing.
- B. Store materials to prevent deterioration.
  1. Store tiles on flat surfaces.
  2. Store rolls upright.

## **1.9 FIELD CONDITIONS**

- A. Adhesively Applied Products:
  1. Maintain temperatures during installation within range recommended in writing by manufacturer, but not less than 70 degrees F or more than 95 degrees F, in spaces to receive flooring 48 hours before installation, during installation, and 48 hours after installation unless longer period is recommended in writing by manufacturer.
  2. After postinstallation period, maintain temperatures within range recommended in writing by manufacturer, but not less than 55 degrees F or more than 95 degrees F.
  3. Close spaces to traffic during flooring installation.
  4. Close spaces to traffic for 48 hours after flooring installation unless manufacturer recommends longer period in writing.
  5. Install flooring after other finishing operations, including painting, have been completed.

## **1.10 WARRANTY**

- A. Special Limited Warranty:
  1. Manufacturer's standard form in which manufacturer agrees to repair or replace sports flooring including labor that fails within specified warranty period
- B. Material warranty must be direct from the product manufacturer.
  1. Material warranties must come from original manufacturer or division thereof. Private label warranties from distributors or brokers are not valid. Supply original point of manufacturing upon request.

- C. Failures include, but are not limited to, the following:
  - 1. Material manufacturing defects.
  - 2. Surface wear and deterioration to the point of wear-through of wear layer per ASTM F410/ASTM F1303.
  - 3. Failure due to substrate moisture exposure exceeding 98 percent relative humidity when tested according to ASTM F2170.
- D. Warranty Period:
  - 1. For material defects and surface wear-through: 25 years from date of substantial completion.
  - 2. For moisture vapor tolerance: 25 years from date of substantial completion.
- E. Installer's Limited Warranty:
  - 1. Installer's standard form in which installer agrees to repair or replace sports flooring that fails due to poor workmanship or faulty installation within the specified warranty period.
  - 2. Warranty Period: 2 years from date of substantial completion.

## **PART 2 - PRODUCTS**

### **2.1 SHEET VINYL FLOORING**

- A. Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by the following manufacturer. Other manufacturers offering products with equivalent characteristics may be considered, if deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect. Submit alternative products as substitution requests at least 10 business days before receipt of bids; provide in accordance with provisions of the Conditions of the Contract and Division 01 sections.
  - 1. Tarkett Sports; a division of the Tarkett Group.
  - 2. Product: Omnisports "Speed", 3.45mm; with "Extreme Three Layers Technology (X3LT)" and "TopClean XP" surface.
- B. Description: Sheet vinyl flooring specifically designed for adhered athletic flooring applications. Prefabricated sport surface (0.14 inch) with wood flooring design, single surface embossing and layered construction.
  - 1. Embossing of wood design and solid colors must be the same; varying embossing or surface textures will not be allowed.
  - 2. Printing of wood design shall closely resemble standard wood strip flooring in size, color, board length, and grain appearance.
  - 3. Surface embossing combined with manufacturer's top treatment must offer proper balance of surface friction per the ASTM F2772.
  - 4. Surface embossing combined with manufacturer's top treatment must provide resistance to stains and scratches. Surface profile must not incorporate linear embossing.
  - 5. The wood design shall be protected by a clear layer of pure PVC (Polyvinyl Chloride) and manufacturer's top treatment, a factory-applied UV cured urethane treatment.
  - 6. Layered composition includes fiberglass mesh calendared sheet and cushion, and must offer improved shock absorbing comfort while providing better indentation recovery
  - 7. The cushion force reduction layer shall be high-density closed cell PVC foam with honeycomb embossing, applied in one continuous manufacturing process.
  - 8. Laminated or adhered foam layers will not be allowed.

9. Field constructed products will not be accepted.

C. Physical Properties of the flooring shall conform to the following minimums:

|                           |                 |                                |
|---------------------------|-----------------|--------------------------------|
| Width                     | —               | 6' 6" (2 m)                    |
| Length                    | —               | 75.5' (23m) approx.            |
| Wear Layer                | —               | 2 mm                           |
| Total Thickness           | —               | 3.5 mm                         |
| Wear Layer                | Type 1- Grade 1 | ASTM F1303/F410                |
| Vertical Deformation      | PASSED          | ASTM F2772                     |
| Rolling Load              | PASSED          | 0.30 (EN 1569 {11/1999})       |
| Surface Finish Effect     | PASSED          | ASTM F2772 (80 – 110)          |
| Chemical Resistance       | Excellent       | ASTM F925                      |
| Impact Resistance         | PASSED          | EN 1517                        |
| Abrasion Resistance       | PASSED          | 0.10 (EN ISO 5470-1 {06/1999}) |
| Static Load Limit         | PASSED          | ASTM F970- Load 175 Lbs        |
| Sound Insulation          | Excellent       | +/- 19 dB (ISO 717/2)          |
| In-Room Sound Insulation  | Excellent       | 61dB (NF S31-074)              |
| Ball Rebound              | PASSED          | ASTM F2772 > 90%               |
| Force Reduction           | PASSED          | ASTM F2772 Class 1             |
| Fire Rating               | PASSED          | ASTM E648 Class 1              |
| Microbial Assays Test     | No Growth       | G21 ASTM - Backing             |
| Phthalate-free technology | —               | YES                            |
| REACH Compliant           | —               | YES                            |
| Heavy Metals              | —               | NO                             |
| ISO 9001                  | —               | YES                            |
| ISO 14001                 | —               | YES                            |

D. Seaming Method: Heat welded.

1. Color to blend with flooring surface color and design.
2. Weld seams to create a monolithic and impermeable surface.

E. Traffic-Surface Texture: Embossed - wood grain.

F. Color and Pattern: As selected by Architect from manufacturer's full range.

## 2.2 ACCESSORIES

A. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by flooring manufacturer.

B. Adhesives: Water-resistant type recommended in writing by manufacturer for substrate and conditions indicated.

C. Game-Line and Marker Paint: Complete system including primer, if any, compatible with flooring and recommended in writing by flooring and paint manufacturers for use indicated.

D. Thresholds and Transition Pieces: Manufacturer's standard pieces at doorways and other transition points.

## **2.3 EXAMINATION**

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance of the Work.
  - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

## **2.4 PREPARATION**

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of flooring.
- B. Concrete Substrates: Prepare according to ASTM F710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Alkalinity Testing: Perform pH testing according to ASTM F710. Proceed with installation only if pH readings are not less than 7.0 and not greater than 11.
  - 3. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
    - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    - b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended in writing by manufacturer. Do not use solvents.
- D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- E. Move flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation unless manufacturer recommends a longer period in writing.
  - 1. Do not install flooring until it is the same temperature as space where it is to be installed.
- F. Sweep and vacuum clean substrates to be covered by flooring immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

## **2.5 FLOORING INSTALLATION, GENERAL**

- A. Comply with manufacturer's written installation instructions.

- B. Scribe, cut, and fit flooring to butt neatly and tightly to vertical surfaces, equipment anchors, floor outlets, and other interruptions of floor surface.
- C. Extend flooring into toe spaces, door reveals, closets, and similar openings unless otherwise indicated.
- D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating subfloor markings on flooring. Use nonpermanent, nonstaining marking device.

## **2.6 SHEET FLOORING INSTALLATION**

- A. Unroll sheet flooring and allow it to stabilize before cutting and fitting.
- B. Lay out sheet flooring as follows:
  - 1. Maintain uniformity of flooring direction.
  - 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.
  - 3. Match edges of flooring for color shading at seams.
  - 4. Locate seams according to approved Shop Drawings.
- C. Adhere products to substrates using a full spread of adhesive applied to substrate to comply with adhesive and flooring manufacturers' written instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times.
  - 1. Provide completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- D. Vinyl Sheet Flooring Seams: Prepare and finish seams to produce surfaces flush with adjoining flooring surfaces.
  - 1. Heat-Welded Seams: Comply with ASTM F1516. Rout joints and use welding bead to permanently fuse sections into a seamless flooring.

## **2.7 GAME LINES AND MARKERS**

- A. Mask flooring at game lines and markers, and apply paint to produce sharp edges. Where crossing, break minor game line at intersection; do not overlap lines.
- B. Apply game lines and markers in widths and colors according to requirements indicated on Drawings.

## **2.8 CLEANING AND PROTECTION**

- A. Perform the following operations immediately after completing flooring installation:
  - 1. Remove adhesive and other blemishes from flooring surfaces.
  - 2. Sweep and vacuum flooring thoroughly.
  - 3. Damp-mop flooring to remove marks and soil after time period recommended in writing by manufacturer.

- B. Protect flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
  - 1. Do not move heavy and sharp objects directly over flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

**END OF SECTION**

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## SECTION 09 6813

### CARPET TILE

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes modular, fusion-bonded carpet tile and carpet base.
- B. Related Sections include the following:
  - 1. Legend-Finish on Drawings for colors and patterns.
  - 2. Section 09 6519 "Resilient Floor Tile and Accessories" for resilient wall base and accessories installed with carpet tile.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate.
- B. Shop Drawings: Show the following:
  - 1. Carpet tile type, color, and dye lot.
  - 2. Type of subfloor.
  - 3. Type of installation.
  - 4. Pattern of installation.
  - 5. Pattern type, location, and direction.
  - 6. Pile direction.
  - 7. Type, color, and location of insets and borders.
  - 8. Type, color, and location of edge, transition, and other accessory strips.
  - 9. Transition details to other flooring materials.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
  - 1. Carpet Tile: Full-size Sample.
  - 2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch- (300-mm-) long Samples.
- D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.
- F. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
  - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
  - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.



- G. Warranty: Special warranty specified in this Section.

#### **1.4 QUALITY ASSURANCE**

- A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.
- B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Product Options: Products and manufacturers named in Part 2 establish requirements for product quality in terms of appearance, construction, and performance. Other manufacturers' products comparable in quality to named products and complying with requirements may be considered.
- D. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to carpet tile installation including, but not limited to, the following:
  - 1. Review delivery, storage, and handling procedures.
  - 2. Review ambient conditions and ventilation procedures.
- E. Mock-ups: Provide a mock-up for each type of carpet installation.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Comply with CRI 104, Section 5, "Storage and Handling."

#### **1.6 PROJECT CONDITIONS**

- A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."
- B. Environmental Limitations: Do not install carpet tiles until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

#### **1.7 WARRANTY**

- A. Special Warranty for Carpet Tiles: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
  - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
  - 2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, dimensional stability, and delamination.
  - 3. Warranty Period: Lifetime Commercial Limited.

## 1.8 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Carpet Tile (Field): Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.
  - 2. Carpet Tile (Accent): Full-size units equal to 10 percent of amount installed for each type indicated, but not less than 10 sq. yd.

## PART 2 - PRODUCTS

### 2.1 CARPET TILE

- A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other available manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
  - 1. Manufacturer: Patcraft
  - 2. Products: Collection: Mixed Materials Converge, StileCube and Colour
- B. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers with products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Interface, Inc.
  - 2. Lees Carpet, a brand of the Mohawk Group.
  - 3. Shaw Contract Group.
  - 4. Tandus Centiva, a Tarkett company.
- C. Carpet Properties:
  - 1. Construction: Multi-level pattern loop
  - 2. Fiber: Solution Q Extreme® Nylon
  - 3. Face Weight: 22 oz./ square yard.
  - 4. Pile Height: 0.097 inch.
  - 5. Stitches per inch: 10.
  - 6. Secondary Backing: EcoWorx Tile.
  - 7. Shapes: "Facet" and 12 x 24 inch planks.

### 2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
  - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
  - 2. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider and protrusions more than 1/32 inch (0.8 mm), unless more stringent requirements are required by manufacturer's written instructions.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

### **3.3 INSTALLATION**

- A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.
- C. Maintain dye lot integrity. Do not mix dye lots in same area.
- D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- G. Install pattern parallel to walls and borders. Turn carpet tiles as shown on Drawing, or if not shown, as directed by Architect.

### **3.4 CLEANING AND PROTECTION**

- A. Perform the following operations immediately after installing carpet tile:
  - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
  - 2. Remove yarns that protrude from carpet tile surface.
  - 3. Vacuum carpet tile using commercial machine with face-beater element.
  
- B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protection of Indoor Installations."
  
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

**END OF SECTION**

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## SECTION 09 6816

### SHEET CARPETING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. Section includes sheet carpet.
- B. Related Sections include the following:
  - 1. Key-Finish on Drawings for colors and patterns.
  - 2. Section 09 6513 "Resilient Wall Base" for rubber base and accessories installed with carpet.
  - 3. Section 09 6813 "Tile Carpeting" for coordinating carpet tile.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate required.
- B. Shop Drawings: Show the following:
  - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
  - 2. Carpet type, color, and dye lot.
  - 3. Locations where dye lot changes occur.
  - 4. Seam locations, types, and methods.
  - 5. Type of subfloor.
  - 6. Type of installation.
  - 7. Pattern type, repeat size, location, direction, and starting point.
  - 8. Pile direction.
  - 9. Type, color, and location of insets and borders.
  - 10. Type, color, and location of edge, transition, and other accessory strips.
  - 11. Transition details to other flooring materials.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
  - 1. Carpet: 24-inch-square sample.
  - 2. Exposed Edge Stripping and Accessory: 12-inch-long samples, showing full range of colors.
- D. Product Schedule: Use same room and product designations indicated on Drawings and in schedules.

- E. Maintenance Data: For carpet to include in maintenance manuals specified in Division 1. Include the following:
  - 1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
  - 2. Precautions for cleaning materials and methods that could be detrimental to carpet.

#### **1.4 QUALITY ASSURANCE**

- A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.
- B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Product Options: Products and manufacturers named in Part 2 establish requirements for product quality in terms of appearance, construction, and performance. Other manufacturers' products comparable in quality to named products and complying with requirements may be considered.
- D. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
  - 1. Provide a mockup for each type of carpet installation; size and location as directed by Architect.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. General: Comply with CRI 104 "Standard for Installation of Commercial Carpet - 2015", Section 4, "Storage."

#### **1.6 PROJECT CONDITIONS**

- A. General: Comply with CRI 104 "Standard for Installation of Commercial Carpet - 2015", Section 7, "Site Conditions."
- B. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet manufacturer.

- D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

## 1.7 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Carpet Warranty: Written warranty, signed by carpet manufacturer agreeing to replace carpet that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.
  - 1. Warranty Period: 10 years from date of Substantial Completion.

## 1.8 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Carpet: Full-width rolls equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.
  - 2. Carpet Base: Fifty linear feet of prepared base, with binding edge.

## PART 2 - PRODUCTS

### 2.1 CARPET

- A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
  - 1. Manufacturer: Patcraft.
  - 2. Product: As selected by Architect from manufacturer's full range.
  - 3. To be considered as equivalent to the Basis of Design, products by Acceptable Manufacturers must meet the following criteria:
    - a. Have a carpet (matching colors of BoD indicated in Finish Legend), which is standard and not custom.
    - b. Have a minimum surface weight of 30 oz. per square yard.
    - c. Be made of 100 percent solution-dyed cationic fiber.
    - d. Have a comparable, water-resistant backing system.
- B. Performance Characteristics: As follows:
  - 1. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.
  - 2. Dry Breaking Strength: Not less than 100 lbf per ASTM D 2646.
  - 3. Resistance to Insects: Comply with AATCC-24.
  - 4. Colorfastness to Crocking: Not less than 4, wet and dry, per AATCC-165.



5. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) per AATCC-16.
6. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria; not less than 1-mm halo of inhibition for gram-negative bacteria; no fungal growth; per AATCC-174.

## **2.2 INSTALLATION ACCESSORIES**

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by the carpet manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and that is recommended by the carpet manufacturer.
- C. Seaming Cement: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Verify that substrates and conditions are satisfactory for carpet installation and comply with requirements specified.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
  1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by the carpet manufacturer.
  2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving carpet.
  3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. General: Comply with CRI 104 "Standard for Installation of Commercial Carpet - 2015", Section 7, "Site Conditions; Section 8 "Floor Preparation," and carpet manufacturer's written installation instructions for preparing substrates indicated to receive carpet installation.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by the carpet manufacturer.

- D. Broom and vacuum clean substrates to be covered immediately before installing carpet. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.3 INSTALLATION**

- A. Direct-Glue-Down Installation: Comply with CRI 104 "Standard for Installation of Commercial Carpet - 2015", Section 13, "Direct Glue-Down Installation".
- B. Comply with carpet manufacturer's written recommendations for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.
  - 1. Level adjoining border edges.
  - 2. Treat seams in accordance with CRI 104 "Standard for Installation of Commercial Carpet - 2015", section 12 "Carpet Seaming".
- C. Do not bridge building expansion joints with carpet.
- D. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.
- E. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- G. Install pattern parallel to walls and borders, unless indicated otherwise.
- H. Carpet Base: Install tight to floor and wall. Apply with adhesive as recommended by carpet manufacturer.

### **3.4 CLEANING AND PROTECTION**

- A. Perform the following operations immediately after installing carpet:
  - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
  - 2. Remove yarns that protrude from carpet surface.
  - 3. Vacuum carpet using commercial machine with face-beater element.
- B. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer.

**END OF SECTION**

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## SECTION 09 7713

### DECORATIVE METAL WALL PANELS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes decorative metal wall panels.
- B. Related Sections include the following:
  - 1. Section 07 2100 "Thermal Insulation" for acoustical fabric behind certain metal panels.
  - 2. Section 07 4213 "Metal Wall Panels" for exterior panels and metal soffits.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of panel edge and core material specified.
- B. Shop Drawings: Include types of panels and attachment devices; and details at head, base, joints, corners, and intersections.
- C. Samples for Verification: Provide samples of each type of panel to be used for the Work.

##### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect metal panels from excessive moisture in shipment, storage, and handling. Deliver in unopened bundles and store in a dry place with adequate air circulation.

##### 1.5 PROJECT CONDITIONS

- A. Field Measurements General: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

#### PART 2 - PRODUCTS

##### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. McNichols Co.; [www.mcnichols.com](http://www.mcnichols.com)

## **2.2 METAL WALL PANELS**

- A. 0.1345 inch (10 gage) perforated steel panel with 1/8 inch diameter holes on 3/16 inch staggered centers, 50 percent open area. Provide 1 inch wide solid metal border on all sides. Fasten with #10 S.S. socket drive button head fastener
  - 1. Type III panels shall be finished with a clear sealer. Refer to Division 9 Section "Painting" for coating requirements.
  
- D. Aluminum Treatment: Passivate aluminum surfaces prior to application of graphics using a chromate conversion coating (Henkel "Alodine" or equivalent) to assure proper bonding of graphic to aluminum substrate.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
  
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
  
- C. Field Welding: Comply with the following requirements:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

**END OF SECTION**

## SECTION 09 8433

### ACOUSTICAL WALL AND CEILING PANELS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This **Section includes** the following:
  - 1. Acoustical wall panels.
  - 2. Softwood trim around wall panel edges.

##### 1.3 SUBMITTALS

- A. **Product Data:** For each type of product indicated.
- B. **Shop Drawings:** Show fabrication and installation details for acoustical panels, including plans, elevations, sections, details, and attachments to other Work.
- C. **Samples:** 8-by-11-inch units of each type of acoustical panel indicated. Include samples of installation devices and accessories.
- D. **Maintenance Data:** For acoustical panels to include in maintenance manuals specified in Division 1.

##### 1.4 QUALITY ASSURANCE

- A. **Manufacturer Qualifications:** A firm experienced in manufacturing acoustical panels similar to those indicated for this Project and with a record of successful in-service performance.
- B. **Source Limitations for Acoustical Panels:** Obtain acoustical panels from one source with resources to provide products of consistent quality in appearance and physical properties.
- C. **Fire-Test-Response Characteristics:** Provide acoustical panels with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify acoustical panels with appropriate markings of applicable testing and inspecting agency.
  - 1. Flame Spread: 25 or less.
  - 2. Smoke Developed: 450 or less.

##### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. **Protect acoustical panels** from excessive moisture when shipping, storing, and handling. Deliver in unopened bundles and store in a dry place with adequate air circulation. Do not deliver material to building until wet-work, such as concrete and plaster, has been completed and cured to a condition of equilibrium. Protect panel edges from crushing and impact.

## 1.6 PROJECT CONDITIONS

- A. **Environmental Limitations:** Do not install acoustical panels until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. **Air-Quality Limitations:** Protect acoustical panels from exposure to airborne odors, such as tobacco smoke, and install panels under conditions free from odor contamination of ambient air.
- C. **Field Measurements:** Verify surface dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. **Established Dimensions:** Where field measurements cannot be made without delaying the Work, establish surface dimensions and proceed with fabricating acoustical panels without field measurements. Coordinate construction to ensure that actual surface dimensions correspond to established dimensions.

## 1.7 EXTRA MATERIALS

- A. **Furnish extra materials** described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. **Acoustical Panels:** Full-size units equal to 2 percent of amount installed.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. **Acceptable Manufacturer:** Subject to compliance with requirements of Contract Documents, provide products by the following:
  - 1. **Manufacturer:** Tectum, Inc.
  - 2. **Product:** Finale Wall Panel System.

### 2.2 MATERIALS

- A. **General:**
  - 1. **Minimum Recycled Content:** Postconsumer recycled content plus one-half of preconsumer recycled content not less than 40 percent by weight.
  - 2. Made with binder containing no urea formaldehyde.
- B. **Wood Fiber Acoustic Panels**
  - 1. Wall and ceiling panels shall be standard 2 inches thick, including factory assembled glass fiber insulation with dimensions shown on the drawings.
  - 2. Panels shall be fabricated from aspen wood fibers bonded with an inorganic hydraulic binder. Panel shall have 0-25 flame spread and 0-450 fuel contribution in accordance with ASTM E 84.
  - 3. Provide beveled edge.
- C. **Unfaced, Glass-Fiber Board Insulation:** Thermal insulation combining glass fibers with thermosetting resin binders to comply with ASTM C 612, Type IA and IB; and with other requirements indicated below:
  - 1. Nominal density of 2.5 lb/cu. ft., thermal resistivity of 4.3 degrees F x h x sq. ft./Btu x in. at 75 degrees F.
  - 2. **Surface-Burning Characteristics:** Maximum flame-spread and smoke-developed indices of 25 and 50, respectively.

- D. **Softwood Trim Around Panel Edges:** Provide finished lumber and moldings complying with the following requirements including those of the grading agency listed with species:
1. Species: Poplar; NLGA, WCLIB, or WWPA.
  2. Grade: B & Btr. Select or Supreme.
  3. Texture: Surfaced (smooth).
  4. Lumber for Painted Finish: Glued-up lumber or solid lumber stock
- E. **Miscellaneous Materials:**
1. Acoustical Sealant: Resilient, non-staining, non-shrinking, non-hardening, non-skinning, non-drying, non-sag sealant intended for interior sealing of concealed construction joints.

### 2.3 ACOUSTICAL PANELS, GENERAL

- A. **Fabricate panels** to sizes and configurations indicated.
- B. **Dimensional Tolerances of Finished Units:** Plus or minus 1/16 inch for the following:
1. Thickness.
  2. Edge straightness.
  3. Overall length and width.
  4. Squareness from corner to corner.
  5. Chords, radii, and diameters.
- C. **Sound-Absorption Performance:** Provide acoustical panels with minimum noise reduction coefficients indicated, as determined by testing per ASTM C 423 for mounting type specified.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. **Examine substrates** and blocking, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting acoustical panel performance. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. **Install acoustical panels** in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels, and scribed to fit adjoining work accurately at borders and at penetrations. Comply with panel manufacturer's written instructions for installation of panels using type of mounting accessories indicated or, if not indicated, as recommended by manufacturer.
1. Cut units to be at least 50 percent of unit width. Scribe acoustical panels to fit adjacent work. Butt joints tightly.
- B. **Construction Tolerances:** As follows:
1. Variation from Plumb and Level: Plus or minus 1/16 inch.
  2. Variation of Joints from Hairline: Not more than 1/16 inch.

### 3.3 CLEANING

- A. **Remove surplus materials**, rubbish, and debris resulting from acoustical panel installation, on completion of the Work, and leave areas of installation in a neat and clean condition.



### 3.4 PROTECTION

- A. **Provide final protection** and maintain conditions, in a manner acceptable to manufacturer and Installer, and ensure acoustical panels are without damage or deterioration at time of Substantial Completion.
- B. **Replace panels** that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

**END OF SECTION**

## SECTION 09 9100

### PAINTING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

##### 1.2 SUMMARY

- A. **Section includes** painting work, interior and exterior. Work includes, but is not limited to painting the following:
1. Exterior steel.
  2. Exterior concrete where indicated on Drawings.
  3. Metal doors, metal door frames, grilles, frames and fire extinguisher cabinet doors.
  4. Exterior metal mechanical units, grilles and louvers.
  5. Interior walls and ceilings.
  6. Interior steel rails and misc. metal.
  7. Exterior exposed metal flashing.
  8. Interior and exterior wall mounted speakers.
  9. Interior and exterior masonry. (See Division 7 for exterior water repellents.)
  10. Interior wood including but not limited to trim, moldings and miscellaneous items such as built-in ironing board covers.
  11. Work includes field painting of exposed bare and covered pipes and ducts (including color coding), and of hangers, exposed steel and iron work, plug mold, electric panels, and primed metal surfaces of equipment installed under mechanical and electrical work, except as otherwise indicated.
- B. **Related Sections:**
1. Section 07 1900 "**Water Repellents**" for coatings applied to exterior masonry.
  2. Section 09 0000 "**Finish Schedule**" for product selections and colors.
  3. **Shop Primers:** Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, metal fabrications, hollow metal work and similar items.
    - a. Unless otherwise specified, shop priming of fabricated components such as architectural woodwork, wood casework and shop-fabricated or factory-built mechanical and electrical equipment or accessories is included under other sections of these specifications.
    - b. Comply with PDCA Standard P15 "Painting of Shop Primed Substrates"
- C. **"Paint"** as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

- D. **Gloss and Sheen Definitions** shall determine the equivalency of the desired finish luster when described in the construction documents by a traditional name instead of gloss units due to the wide variance of sheen descriptions available from manufacturer to manufacturer. Gloss shall be determined by ASTM D523 - 08 Standard Test Method for Specular Gloss.
1. Flat: Refers to a lusterless or matte finish with a gloss range below 5 units when measured with a 60 degree meter and no more than 10 units measured at an 85 degree meter.
  2. Low-Sheen: Refers to a velvet-like finish with a gloss range below 10 units when measured with a 60 degree meter and between 10-35 units measured at an 85 degree meter.
  4. Satin: Refers to low-to-medium range finish with a gloss range between 20-35 units when measured with a 60 degree meter and at least 35 units measured at an 85 degree meter.
  5. Semi-Gloss: Refers to a medium sheen finish with a gloss range between 35-70 units when measured with a 60 degree meter.
  6. Gloss: Refers to a high sheen finish with a gloss range between 70-85 units when measured with a 60 degree meter.
  7. High-Gloss: Refers to a very high sheen finish with a gloss range more than 85 units when measured with a 60 degree meter.
- E. **Drywall Finishing Levels:** Except where otherwise specified, a Drywall Finishing Level 5 is required on gypsum board substrates scheduled to receive an eggshell or higher sheen. Drywall Finishing Level 4 is acceptable with the use of flat and low-sheen paints, except where critical lighting conditions are determined to be an issue by the Architect.
- F. **Surfaces to be Painted:** Except where natural finish of material is specifically noted as a surface not to be painted, paint all exposed surfaces whether or not colors are designated in "schedules". Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas. If color or finish is not designated, Architect will select these from manufacturer's full range of colors and finishes. Multiple colors will be selected by the Architect for any type of paint system. If colors are not indicated on the drawings, provide for a minimum of 20 percent of the walls to be an accent color.
1. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.
  2. Walls behind scheduled coverings shall receive prime coat.
  3. If it can be seen, *paint it*.
- G. **Following categories of work are not included** as part of field-applied finish work:
1. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer-finishing is specified for such items as (but not limited to) metal toilet enclosures, pre-finished partition systems, architectural woodwork and casework, elevator entrance doors and frames, elevator equipment, and finished mechanical and electrical equipment, including light fixtures, switchgear and distribution cabinets.
  2. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, foundation spaces, furred areas, utility tunnels, pipe spaces and duct shafts.
  3. Finished Metal Surfaces: Unless otherwise indicated, metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting.
  4. Operating Parts: Unless otherwise indicated, moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts will not require finish painting.
  5. Labels: Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

### 1.3 SUBMITTALS

- A. **Product Data:** Submit manufacturer's technical information including Paint label analysis and application instructions for each material proposed for use.
- B. **Sustainability:** For paints and coatings, printed statement of VOC content demonstrating conformance to Utah Air Quality Regulations (R307-361).
- C. **Samples:** Prior to beginning work, review Finish Schedule for colors to be painted. Use representative colors when preparing samples for review. Submit samples for Architect's review of color and texture only. Provide a listing of material and application for each coat of each finish sample.
  - 1. On 12 inch x 12 inch hardboard, provide two samples of each color and material, with texture to simulate actual conditions. Resubmit samples as requested by Architect until acceptable sheen, color, and texture is achieved.
  - 2. On actual wood surfaces, provide two 4 inch x 8 inch samples of natural and stained wood finish. Label and identify each as to location and application.
  - 3. On actual wall surfaces and other exterior and interior building components, duplicate painted finishes of prepared samples. Refer to "Mockups" below.

### 1.4 QUALITY ASSURANCE

- A. **Single Source Responsibility:** Provide primers and other undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only within recommended limits.
- B. **Coordination of Work:** Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information or characteristics of finish materials provided for use, to ensure compatible prime coats are used.
- C. **Mockups:** Apply full-coat mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution. Simulate finished lighting conditions for review of in-place work.
  - 1. Architect will select one surface, except as noted below, to represent surfaces and conditions for application of each paint system.
    - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
    - b. Other Items: Architect will designate items or areas required.
    - c. Masonry to Receive Clear Coat: Provide free-standing samples of honed masonry, 48 inches x 48 inches for initial review of clear coat.
  - 2. Final approval of color selections will be based on mockups.
    - a. If preliminary color/sheen selections are not approved, apply additional mockups of additional colors/sheens selected by Architect at no added cost to Owner.
  - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

### 1.5 DELIVERY AND STORAGE

- A. **Deliver materials** to job site in original, new and unopened packages and containers bearing manufacturer's name and label, and following information:
  - 1. Name or title of material.
  - 2. Federal Specification number, if applicable.

3. Manufacturer's batch number and date of manufacture.
4. Manufacturer's name.
5. Contents by volume, for major pigment and vehicle constituents.
6. Thinning instructions.
7. Application instructions.
8. Color name and number.

B. **Store materials** not in actual use in tightly covered containers. Maintain containers used in storage of paint in a clean condition, free of foreign materials and residue.

1. Protect from freezing where necessary. Keep storage area neat and orderly. Remove oily rags and waste daily. Take all precautions to ensure that workmen and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing and application of paints.

## 1.6 PROJECT CONDITIONS

A. **Apply water-based paints** only when temperature of surfaces to be painted and surrounding air temperatures are between 50 degrees F and 90 degrees F, unless otherwise permitted by paint manufacturer's printed instructions.

B. **Apply solvent-thinned paints** only when temperature of surfaces to be painted and surrounding air temperatures are between 45 degrees F and 95 degrees F, unless otherwise permitted by paint manufacturer's printed instructions.

C. **Do not paint in snow, rain, fog or mist**, or when relative humidity exceeds 85 percent, or to damp or wet surfaces, unless otherwise permitted by paint manufacturer's printed instructions.

1. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.

D. **Determine moisture content of surfaces** to be painted by performing appropriate tests using a commercially available moisture meter. Apply paint only when surfaces are within limits specified by the paint manufacturer's printed instructions.

## 1.7 MAINTENANCE MATERIALS

A. **Furnish extra materials** that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gallon of each material and color applied.
2. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, such as Sherwin-Williams "Custodian Project Color and Product Information" report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER

- A. **Basis of Design Manufacturer:** Contract Documents are based on products specified in Part 3 Schedules to establish a standard of quality. Other acceptable manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
1. Manufacturer: **Sherwin-Williams** Company.
- B. **Acceptable Manufacturers:** Subject to compliance with requirements of Contract Documents, provide products by one of the following manufacturers.
1. PPG Industries, Pittsburgh Paints.
  2. The Sherwin-Williams Company (S-W).
  3. Benjamin Moore & Co.

### 2.2 MATERIALS

- A. **Low-Emitting Materials - VOC Content (Utah Administrative Code R307-361):** Products shall comply with VOC limits of authorities having jurisdiction and, for interior and exterior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24)].
1. Flat Paints and Coatings: 50 g/L.
  2. Nonflat Paints and Coatings: 100 g/L.
  3. Dry-Fog Coatings: 150 g/L.
  4. Primers, Sealers, and Undercoaters: 100 g/L.
  5. Industrial maintenance Coatings Applied to Ferrous Metals: 250 g/L.
  6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
  7. Pretreatment Wash Primers: 420 g/L.
  8. Floor Coatings Foot Traffic: 100 g/L.
  9. Floor Coatings High Performance: 250 g/L.
  10. Shellacs, Clear: 730 g/L.
  11. Shellacs, Pigmented: 550 g/L.
  12. Wood Coatings: 275 g/L.
- B. **Material Quality:** Provide best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable.
- C. **Proprietary names** used to designate color or materials are not intended to imply that products of named manufacturers are required to exclusion of equivalent products of other manufacturers.
- D. **Federal Specifications** establish minimum acceptable quality for paint materials. Provide written certification from paint manufacturer that materials provided meet or exceed these minimums.
- E. **Manufacturer's products** which comply with coating qualitative requirements of applicable Federal Specifications, yet differ in quantitative requirements, may be considered for use when acceptable to Architect. Furnish material data and manufacturer's certificate of performance to Architect for any proposed substitutions.
- F. **Color Pigments:** Pure, non-fading, applicable types to suit substrates and service indicated.

- G. **Lead content in pigment**, if any, is limited to contain not more than 0.009 percent lead, as lead metal based on the total non-volatile (dry-film) of paint by weight.
1. This limitation is extended to interior surfaces and those exterior surfaces, such as stairs, decks, porches, railings, windows, and doors which are readily accessible to children under seven years of age.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. **Applicator must examine areas** and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Applicator.
1. Comply with PDCA Standard P4 "Responsibility for Inspection and Acceptance of Surfaces prior to Painting and Decorating
- B. **Starting of painting work** will be construed as Applicator's acceptance of surfaces and conditions within any particular area.
- C. **Do not paint over dirt**, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

### 3.2 PREPARATION

- A. **General:** Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.
- B. **Barrier Coats:** Provide barrier coats over incompatible primers or remove and re-prime as required. Notify Architect in writing of any anticipated problems in using the specified coating systems with substrates primed by others.
- C. **Accessories Removal:** Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items.
- D. **Surface Preparation:** Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly-painted surfaces.
- E. **Cementitious Materials:** Prepare cementitious surfaces to be painted by removing efflorescence, chalk, dust, dirt, grease, oils, and by roughening as required to remove glaze.
1. **Determine alkalinity and moisture content** of surfaces to be painted by performing appropriate tests. If surfaces are found to be sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application of paint. Do not paint over surfaces where moisture content exceeds that permitted in manufacturer's printed directions.

2. **Concrete Floors:**
  - a. Floors must be structurally sound and fully cured a minimum of 28 days. Test floor for vapor drive in accordance with ASTM D 4263, ASTM F 2170 or ASTM F 2420. If vapor drive exceeds the levels recommended by the manufacturer of the flooring system, a moisture mitigation system, as approved by Architect, may be applied to reduce the permeance of moisture vapor to acceptable levels.
  - b. Repair concrete as necessary.
  - c. Use a commercial degreaser to clean floors of oil, grease, and other bond inhibiting materials.
  - d. Remove curing and parting compounds and other surface hardeners and floor coatings in accordance with the manufacturer's instructions.
  - e. Mechanical surface profiling is the recommended method of surface preparation for both new and existing floors. Mechanically profile the floor to CSP 3 (approximately medium grit sandpaper) as described by the International Concrete Repair Institute (Guideline #310.2). Do not use acid etching for surface preparation. Do not use any method that will fracture the concrete.
  - f. Apply a 25 square foot test in an inconspicuous area that meets Owner's expectation for appearance, slip resistance and performance.
  
- F. **Ferrous Metals:** Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.
  1. Caulk fabrication joints in hollow metal door frames which paint application cannot bridge.
  2. Follow manufacturer's surface preparation recommendations for ferrous metal substrates, ranging from one of the following procedures:
    - a. SSPC-SP 1 - Solvent Cleaning (Nov-04)
    - b. SSPC-SP 2 - Hand Tool Cleaning (Nov-04)
    - c. SSPC-SP 3 - Power Tool Cleaning (Nov-04)
    - d. SSPC-SP 5/NACE No. 1 - White Metal Blast Cleaning (Jan-07)
    - e. SSPC-SP 6/NACE No. 3 - Commercial Blast Cleaning (Jan-07)
    - f. SSPC-SP 7/NACE No. 4 - Brush-Off Blast Cleaning (Jan-07)
    - g. SSPC-SP 8 - Pickling (Nov-04)
    - h. SSPC-SP 10/NACE No. 2 - Near-White Metal Blast Cleaning (Jan-07)
    - i. SSPC-SP 11 - Power Tool Cleaning to Bare Metal (July-12)
    - j. SSPC-SP 14/NACE No. 8 - Industrial Blast Cleaning (Jan-07)
    - k. SSPC-SP 15 - Commercial Grade Power-Tool Cleaning (July-12)
    - l. SSPC-SP 16 - Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals (Apr-10)
  
- G. **Touch-up:** Touch-up shop-applied prime coats wherever damaged or bare, where required by other sections of these specifications. Clean and touch-up with same type shop primer.
  
- H. **Galvanized Surfaces:** Clean free of oil and surface contaminants with non-petroleum based solvent. Comply with best practices specified in ASTM D6386 - 10 "Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting."



- I. **Wood:** Clean wood surfaces to be painted of dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view, and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.
1. Prime, stain, or seal wood required to be job-painted immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of such wood, including cabinets, counters, cases, paneling.
  2. When transparent finish is required, use spar varnish for backpriming.
  3. Exterior Wood Substrates:
    - a. Scrape and clean knots, and apply coat of knot sealer before applying primer.
    - b. Prime edges, ends, faces, undersides, and backsides of wood.
      - 1) For solid hide stained wood, stain edges and ends after priming.
      - 2) For varnish-coated stained wood, stain edges and ends and prime with varnish. Prime undersides and backsides with varnish.
    - c. Countersink steel nails, if used, and fill with putty or plastic wood filler tinted to final color. Sand smooth when dried.
  4. Interior Wood Substrates:
    - a. Scrape and clean knots, and apply coat of knot sealer before applying primer.
    - b. Apply wood filler paste to open-grain woods, as defined in "MPI Architectural Painting Specification Manual," to produce smooth, glasslike finish.
    - c. Sand surfaces exposed to view and dust off.
    - d. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dry.
- J. **Materials Preparation:**
1. Mix and prepare painting materials in accordance with manufacturer's directions.
  2. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.
  3. Stir materials before application to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

### 3.3 APPLICATION

- A. **General:** Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors, surface treatments, and finishes, are indicated in "schedules" of the contract documents.
  2. Provide finish coats which are compatible with prime paints used.
  3. Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to insure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
  4. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently-fixed equipment or furniture with prime coat only before final installation of equipment.
  5. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
  6. Paint back sides of access panels, and removable or hinged covers to match exposed surfaces.
  7. Finish doors on tops, bottoms and side edges same as faces, unless otherwise indicated.

8. Sand lightly between each succeeding enamel or varnish coat.
  9. Omit first coat (exterior faces) of surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.
- B. **Scheduling Painting:** Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. **Re-coat Time:** Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.
  2. **Minimum Coating Thickness:** Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer.
- C. **Mechanical and Electrical Work:** Painting of mechanical and electrical work is limited to those items exposed to mechanical equipment rooms and in occupied spaces.
1. Mechanical items to be painted include, but are not limited to, the following:
    - a. Piping, pipe hangers, and supports.
    - b. Roof mounted mechanical units.
    - c. Ductwork, where exposed in occupied spaces.
    - d. Motor, mechanical equipment, and supports.
    - e. Accessory items.
  2. Electrical items to be painted include, but are not limited to, the following:
    - a. Conduit and fittings.
- D. **Prime Coats:** Apply prime coat of material which is required to be painted or finished, and which has not been prime coated by others.
1. Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.
- E. **Pigmented (Opaque) Finishes:** Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.
- F. **Completed Work:** Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

### 3.4 FIELD QUALITY CONTROL

- A. **Owner will engage services of an independent testing laboratory** to sample paint being used. Samples of materials delivered to project site will be taken, identified and sealed, and certified in presence of Contractor.
1. Testing laboratory will perform appropriate tests for any or all of following characteristics: Abrasion resistance, apparent reflectivity, flexibility, washability, absorption, accelerated weathering, dry opacity, accelerated yellowness, recoating, skinning, color retention, alkali resistance and quantitative materials analysis.
- B. **If test results show** that material being used does not comply with specified requirements, Contractor may be directed to stop painting work, and remove non-complying paint; pay for testing; repaint surfaces coated with rejected paint; remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two coatings are non-compatible.

### 3.5 CLEAN-UP AND PROTECTION

- A. **Clean-Up:** During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day.
1. Upon completion of painting work, clean window glass and other paint spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using car not to scratch or otherwise damage finished surfaces.
- B. **Protection:** Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.
1. Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.
  2. At completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

### 3.6 EXTERIOR PAINT SCHEDULE

- A. **General:** Provide the following **paint systems** for the various substrates as indicated below **or equivalent system** from **acceptable manufacturers** listed above.

- B. **Metal (Aluminum)**

Sherwin-Williams - Latex (100% Acrylic) Systems

1st Coat: S-W Pro Industrial Zero VOC Acrylic Gloss, B66-600  
Series

2nd Coat: S-W Pro Industrial Zero VOC Acrylic Gloss, B66-600  
Series

Finish: Gloss

Thickness (Mils per coat): 6 - 12 wet; 2.5 - 4 dry.

- C. **Metal (Galvanized)**

Sherwin-Williams - Latex (100% Acrylic) Systems

1st Coat: S-W Pro Industrial Pro-Cry Universal Primer B66-310 Series  
Finish: Low sheen.

Thickness: (Mils per coat) 5 - 10 wet; 2 - 4 dry.

VOC: Less than 100 g/L

2nd Coat: S-W Pro Industrial Zero VOC Acrylic Gloss, B66-600  
Series

3rd Coat: S-W Pro Industrial Zero VOC Acrylic Gloss, B66-600  
Series

Finish: Gloss

Thickness: (Mils per coat) 6 - 12 wet; 2.5 - 4 dry.

D. **Metal** (Misc. Iron, Ornamental Iron, Cat Walks, Fire Escapes, Hydrants, Handrails, Ladders, Fences, etc.)

Sherwin-Williams - Latex (100% Acrylic) Systems

1st Coat: S-W Pro Industrial Pro-Cry Universal Primer B66-310 Series  
Finish: Low sheen.  
Thickness: (Mils per coat) 5 - 10 wet; 2 - 4 dry.  
VOC: Less than 100 g/L (LEED VOC limits do not apply on exterior)

2nd Coat: S-W Pro Industrial Zero VOC Acrylic Gloss, B66-600 Series

3rd Coat: S-W Pro Industrial Zero VOC Acrylic Gloss, B66-600 Series  
Finish: Gloss  
Thickness: (Mils per coat) 6 - 12 wet; 2.5 - 4 dry.

E. **Metal** (Exposed Exterior Structural Steel Elements (Columns, Trusses, Decking etc.)

Surface Preparation: Remove all oil and grease from surface with aromatic solvent wipe, such as Xylene or Med. Protect adjacent surfaces from damage. Minimum surface preparation is Hand Tool Clean per SSPC-SP2. Remove all oil and grease from surface by Solvent Cleaning per SSPC-SP1

Sherwin-Williams - Polyamide Epoxy (primer) / Aliphatic Polyurethane (finish)

1st Coat: SW MacroPoxy 646-100, B58 Series  
Thickness: (Mils per coat) 7 - 13 wet; 5 - 10 dry.  
VOC: Less than 100 g/L

2nd Coat: S-W Water-Based Acrolon 100 Polyurethane Gloss, B65-700 Series.

3rd Coat: S-W Water-Based Acrolon 100 Polyurethane Gloss, B65-700 Series.  
Finish: High Gloss  
Thickness: (Mils per coat) 4 - 8 wet; 2 - 4 dry.  
VOC: Less than 100 g/L

F. **Concrete (Exterior Painted)**

Surface Preparation: Allow new cast-in-place concrete to cure minimum of 28 days at 75 degrees F. Verify concrete dryness and prepare concrete surfaces in accordance with SSPC-SP13 and ICRI Technical Guidelines. Abrasive blast or high pressure water blast concrete surfaces to remove laitance, curing compounds, hardeners, sealers and other contaminants and to provide and ICRI-CSP 2-3 surface profile.

Tnemec - Acrylic

1st Coat: Tnemec Enviro-Crete Series 156.  
Finish: Matte.  
Thickness (Mils per coat): 6 - 8 dry.

2nd Coat: Tnemec Enduratone Series 1028  
Finish: Gloss  
Thickness (Mils per coat): 2 - 3 dry.

3rd Coat: Tnemec Enduratone Series 1028  
Finish: Gloss  
Thickness (Mils per coat): 2 - 3 dry.

G. **Masonry (Sealed exterior masonry – Refer to Section 07 1913 “Water Repellents”).**

### 3.7 INTERIOR PAINT SCHEDULE

A. **General:** Provide the following **paint systems** for the various substrates as indicated below **or equivalent system** from approved manufacturers listed above.

B. **Masonry Painted** (Interior Concrete Masonry Units)

Sherwin-Williams - Vinyl Acrylic Systems

1st Coat: S-W ProMar Interior/Exterior Block Filler B25W25

Finish: Flat

Thickness: (Mils per coat) 16 wet - 8 dry.

2nd Coat: S-W ProMar 200 Zero VOC Semi-Gloss, B31-2600 Series

3rd Coat: S-W ProMar 200 Zero VOC Semi-Gloss, B31-2600 Series

Finish: Semi-Gloss

Sheen (at 60 degrees): 25-35 units.

Thickness (Mils per coat): 4 wet - 1.6 dry.

Sherwin-Williams - Epoxy System - 100% Acrylic base coat (Water Base)

1st Coat: S-W Heavy Duty Block Filler, B42W46

Finish: Flat

Thickness: (Mils per coat) 18 - 34 wet, 10 - 18 dry.

VOC: Less than 50 g/L

2nd Coat: S-W Pro Industrial Zero VOC Water-Based Epoxy Gloss, B73-300 Series.

3rd Coat: S-W Pro Industrial Zero VOC Water-Based Epoxy Gloss, B73-300 Series.

Finish: Gloss

Sheen (at 60 degrees): 90+ units.

Thickness (Mils per coat): 5 - 10 wet; 2 - 4 dry.

VOC: 0 g/L

Sherwin-Williams - Vinyl Acrylic Systems

1st Coat: S-W ProMar Interior/Exterior Block Filler B25W25

Finish: Flat

Thickness: (Mils per coat) 16 wet - 8 dry.

2nd Coat: S-W ProMar 200 Zero VOC Eg-Shel, B20-2600 Series

3rd Coat: S-W ProMar 200 Zero VOC Eg-Shel, B20-2600 Series

Finish: Eggshell

Sheen (at 60 degrees): 5+ units.

Thickness (Mils per coat): 4 wet - 1.7 dry.

C. **Masonry - Interior Sealed** (wet look) - Verify gloss with Architect via mockup before proceeding with general application.

Color Wheel (Sherwin-Williams) - Clear Gloss Acrylic-Urethane Sealer

1st Coat: Color Wheel (Sherwin-Williams) Aquatec Acrylic-Urethane

Finish: Gloss

Sheen: 70-80 @ 60 degrees

Thickness: 2.0 mil dry film @ 300 square feet per gallon

VOC: 99g/L

2nd Coat: Color Wheel (Sherwin-Williams) Aquatec Acrylic-Urethane

Finish: Gloss

Sheen: 70-80 @ 60 degrees

Thickness: 2.0 mil dry film @ 300 square feet per gallon

VOC: 99g/L

D. **Metal - (Interior Galvanized)**

Sherwin-Williams - Latex (100% Acrylic) Systems

1st Coat: S-W Pro Industrial Pro-Cry Universal Primer B66-310 Series

Finish: Low sheen.

Thickness: (Mils per coat) 5 - 10 wet; 2 - 4 dry.

VOC: Less than 100 g/L

2nd Coat: S-W Pro Industrial Zero VOC Acrylic Semi-Gloss,  
B66-650 Series

3rd Coat: S-W Pro Industrial Zero VOC Acrylic Semi-Gloss,  
B66-650 Series

Finish: Semi-Gloss

Thickness: (Mils per coat) 6 - 12 wet; 2.5 - 4 dry.

E. **Metal - (Interior Structural Steel - Columns, Joists, Trusses, Beams - Misc. & Ornamental Iron, Doors, Door Frames, Non-Galvanized Metal)**

Sherwin-Williams - Latex (100% Acrylic) Systems

1st Coat: S-W Pro Industrial Pro-Cry Universal Primer B66-310 Series

Finish: Low sheen.

Thickness: (Mils per coat) 5 - 10 wet; 2 - 4 dry.

VOC: Less than 100 g/L

2nd Coat: S-W Pro Industrial Zero VOC Acrylic Gloss, B66-600  
Series

3rd Coat: S-W Pro Industrial Zero VOC Acrylic Gloss, B66-600  
Series

Finish: Gloss

Thickness: (Mils per coat) 6 - 12 wet; 2.5 - 4 dry

F. **Metal - Clear Finish Interior Miscellaneous Metal** (such as guardrails etc.)

Aliphatic urethane or Polyurethane Clear Coat Sealer (used as a rust-preventative coating):

Provide three coats of sealer (the first coat must be shop applied, the second and third coat may be shop applied or field applied at the Contractor's option.) Available manufacturers include but are not limited to the following:

Corotech (Benjamin Moore) V500 Aliphatic Acrylic Urethane Gloss.

Finish: Gloss

Thickness (Mils per coat): 3.5 - 5.0 wet; 2.5 - 3.6 dry.

VOC: 228 g/L

G. **Gypsum Board** (Walls, Ceilings, Gypsum Board, Etc.)

Sherwin-Williams - Vinyl Acrylic Systems

1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer,  
B28W02600 Series.

Finish: Flat

Sheen (at 85 degrees): 0 - 5 units.

Thickness: (Mils per coat) 4 wet, 1.5 dry.

VOC: 0 g/L

2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss,  
B31-2600 Series

3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss,  
B31-2600 Series

Finish: Semi-Gloss

Sheen (at 60 degrees): 25 - 35 units

Thickness: (Mils per coat) 4 wet, 1.6 dry.

VOC: 0 g/L

Sherwin-Williams - Vinyl Acrylic Systems

1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer,  
B28W02600 Series.

Finish: Flat

Sheen (at 85 degrees): 0 - 5 units.

Thickness: (Mils per coat) 4 wet, 1.5 dry.

VOC: 0 g/L

2nd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600  
Series

3rd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600  
Series

Finish: Eggshell

Sheen (at 60 degrees): 5+ units

Thickness: (Mils per coat) 4 wet, 1.6 dry.

VOC: 0 g/L

H. **Gypsum Board** (Interior **Epoxy System** - Walls, Ceilings, Gypsum Board, Etc.)

Sherwin-Williams - Epoxy System (Water Base) with Vinyl Acrylic Primer

1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer,  
B28W02600 Series.

Finish: Flat

Sheen (at 85 degrees): 0 - 5 units

Thickness (Mils per coat): 4 wet, 1.5 dry.

VOC: 0 g/L

2nd Coat: S-W Pro Industrial Zero VOC Water-Based Epoxy  
Gloss, B73-300 series

3rd Coat: S-W Pro Industrial Zero VOC Water-Based Epoxy  
Gloss, B73-300 series

Finish: Gloss (Verify with Architect and Owner)

Sheen (at 60 degrees): 90+ units.

Thickness (Mils per coat): 5 - 10 wet; 2 - 4 dry.

VOC: 0 g/L

I. **Gypsum Board** (Interior **Graphics, Deep Tone Accents, Special Features, Etc.**)

Sherwin-Williams - Vinyl Acrylic

1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer,  
B28W2600 Series

Finish: Flat

Sheen (at 85 degrees): 0 - 5 units

Thickness: (Mils per coat) 4 wet; 1.5 dry.

VOC: 0 g/L

2nd Coat: S-W ProMar 200 Zero VOC Semi-Gloss B31-2600  
series

3rd Coat: S-W ProMar 200 Zero VOC Semi-Gloss B31-2600  
series

Sheen (at 60 degrees): 25 - 35 units.

Thickness (Mils per coat): 4 wet; 1.6 dry.

VOC: 0 g/L

J. **Gypsum Board** (Interior behind Wall Panels, Casework etc.)

Sherwin-Williams - Vinyl Acrylic

1st Coat: S-W ProMar 200 Zero VOC Interior Latex Wall  
Primer, B28W2600 Series.

Finish: Flat

Sheen (at 85 degrees): 0 - 5 units

Thickness: (Mils per coat) 4 wet - 1.5 dry.

VOC: 0 g/L

K. **Concrete Slabs** (Floors **not otherwise scheduled** for special applied finishes in such areas as **Janitor's Closets, Mechanical Rooms** etc.)

Master Builders Solutions (BASF) - 100% Epoxy Polymer base with Aliphatic Polyaspartic  
topcoat

1st coat: BASF "MasterTop GP 500"; apply at rate recommended by  
manufacturer.

2nd coat: BASF "MasterTop TC 683 LO"; apply at rate recommended by  
manufacturer.

Color: As selected by Architect - tinted.

L. **Woodwork** (Stained & Varnished - Clear Finish)

Open Grained Wood

1st Coat: S-W WoodClassics 250 g/L Stain, A49W800 Series

2nd Coat: S-W SHERWOOD Natural Filler, D70T1

3rd Coat: S-W Minwax WB Polyurethane Satin, <275 g/L VOC

4th Coat: S-W Minwax WB Polyurethane Satin, <275 g/L VOC

Closed Grain Wood

1st Coat: S-W WoodClassics 250g/L Stain, A49W800 Series

2nd Coat: S-W Minwax WB Polyurethane Satin, <275 g/L VOC

3rd Coat: S-W Minwax WB Polyurethane Satin, <275 g/L VOC



M. **Woodwork** (Natural - Clear Finish)

Open Grained Wood

1st Coat: S-W SHERWOOD Natural Filler, D70T1

2nd Coat: S-W Minwax WB Polyurethane Satin, <275 g/L VOC

3rd Coat: S-W Minwax WB Polyurethane Satin, <275 g/L VOC

Closed Grain Wood

1st Coat: S-W Minwax WB Polyurethane Satin, <275 g/L VOC

2nd Coat: S-W Minwax WB Polyurethane Satin, <275 g/L VOC

N. **Woodwork** (Painted)

Latex Systems - Semi-Gloss

1st Coat: S-W ProMar 200 Zero VOC Interior Latex  
Primer, B28W2600 Series.

2nd Coat: S-W ProMar 200 Zero VOC Semi-Gloss  
B31-2600 series

3rd Coat: S-W ProMar 200 Zero VOC Semi-Gloss  
B31-2600 series

Thickness (Mils per coat): 4 wet; 1.6 dry

**END OF SECTION**

## **DIVISION 10 - SPECIALTIES**

|                    |                                     |
|--------------------|-------------------------------------|
| Section 10 1100    | Visual Display Boards               |
| Section 10 1200    | Enclosed Bulletin Boards            |
| Section 10 1400    | Signage                             |
| Section 10 2113.15 | Stainless-Steel Toilet Compartments |
| Section 10 2220    | Accordion Folding Partitions        |
| Section 10 2239    | Operable Panel Partitions           |
| Section 10 2613    | Corner Guards                       |
| Section 10 2800    | Toilet and Bath Accessories         |
| Section 10 2826.13 | Custom Restroom Sinks               |
| Section 10 4313    | Defibrillator Cabinet               |
| Section 10 4400    | Fire-Protection Specialties         |
| Section 10 5113    | Metal Lockers                       |
| Section 10 7500    | Flagpoles                           |

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## SECTION 10 1100

### VISUAL DISPLAY BOARDS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following types of visual display boards:
  - 1. Porcelain enamel marker boards (for liquid chalk).
  - 2. Vinyl fabric faced cork tack boards.
  - 3. Custom magnetic strips where indicated on Drawings.
- B. Related Sections: The following sections contain requirements that relate to this section:
  - 1. Section 06 2000 "Finish Carpentry" for wood blocking and grounds.
  - 2. Section 12 2300 "Manufactured Cabinets and Casework" for mounting porcelain enamel marker boards to faces of casework.

##### 1.3 SUBMITTALS

- A. Product Data: Product data for each type of marker board and tack board specified, including manufacturer's specifications and installation instructions, details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Shop Drawings: Provide shop drawings for each type of marker board, and tack board required. Include sections of typical trim members and dimensioned elevations. Show anchors, grounds, reinforcement, accessories, layout, and installation details.
  - 1. Include clips to attach boards to slotted standards on tackable wall system.
- C. Samples: Provide the following samples of each product for selection of colors, patterns, and textures, as required, and for verification of compliance with requirements indicated.
  - 1. Porcelain Enamel Marker Board: Manufacturer's color charts consisting of actual sections of porcelain enamel finish showing the full range of colors available for each type of marker board required.
  - 2. Vinyl-fabric-faced Cork Tack Boards: Manufacturer's color charts consisting of actual sections of vinyl fabric, showing the full range of colors, textures, and patterns available for each type of vinyl-fabric-faced cork tack board indicated.
  - 3. Aluminum Trim and Accessories: Samples of each finish type and color, on 6-inch-long sections of extrusions and not less than 4-inch squares of sheet or plate, showing the full range of colors available.
- D. Certificates: In lieu of laboratory test reports, when permitted by the Architect, submit the manufacturer's certification that vinyl-fabric-faced cork tack board materials furnished comply with requirements specified for flame spread ratings.

## 1.4 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Provide vinyl-fabric-faced tack boards with surface burning characteristics indicated below, as determined by testing assembled materials composed of facings and backings identical to those required in this section, in accordance with ASTM E 84, by a testing organization acceptable to authorities having jurisdiction.
  - 1. Flame Spread: 25 or less.
  - 2. Smoke Developed: 10 or less.
- B. Design Criteria: The drawings indicate sizes, profiles, and dimensional requirements of visual display boards and bulletin boards. Other visual display boards having equal performance characteristics with deviations from indicated dimensions and profiles may be considered, provided deviations do not change the design concept or intended performance. The burden of proof of equality is on the proposer.

## 1.5 PROJECT CONDITIONS

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.
  - 1. Allow for trimming and fitting wherever taking field measurements before fabrication might delay the Work.

## 1.6 WARRANTY

- A. Porcelain Enamel Markerboard Warranty: Furnish the manufacturer's written warranty, agreeing to replace porcelain enamel markerboards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking, provided the manufacturer's instructions with regard to handling, installation, protection, and maintenance have been followed.
  - 1. Warranty Period: Lifetime of the building.

## 1.7 ALLOWANCES

- A. Include an additional area equivalent of four (4) 48 inch x 96 inch vinyl fabric faced tack boards, to be located and sized as directed by Architect, beyond those required by the Contract Documents. Cost to include installation and General Contractor's mark up.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis of Design: Contract Documents are based on products listed below to establish a standard of quality. Other available manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
  - 1. Manufacturer: Claridge Products: [www.claridgeproducts.com](http://www.claridgeproducts.com)
  - 2. Product: Claridge LCS Elite.

- B. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
1. Porcelain Enamel Marker Boards
    - a. Best-Rite Chalkboard Co.
    - b. Claridge Products and Equipment, Inc.
    - c. ADP/Lemco, Inc.
    - d. ONNiT Systems.

## 2.2 MATERIALS

- A. Porcelain Enamel Marker Boards: Provide balanced, high-pressure- laminated porcelain enamel chalkboards of 3-ply construction consisting of face sheet, core material, and backing.
1. Face Sheet: Provide face sheet of 24-gage enameling grade steel especially processed for temperatures used in coating porcelain on steel. Coat the exposed face and exposed edges with a 3-coat process consisting of primer, ground coat, and color cover coat, and the concealed face with a 2-coat process consisting of primer and ground coat. Fuse cover and ground coats to steel at the manufacturer's standard firing temperatures.
    - a. Cover Coat: Provide writing surface with gloss finish intended for use with liquid felt-tipped markers, able to accept magnetic accessories, and also functioning as a projectable surface with minimal reflectivity.
      - 1) Color: As selected by Architect from manufacturer's full range.
  2. Core: Provide the manufacturer's standard 3/8-inch-thick particleboard core material complying with the requirements of ANSI A208.1, Grade 1-M-1
  3. Backing Sheet: Provide the manufacturer's standard 0.015-inch- thick aluminum sheet backing.
  4. Markerboards shall be trimless.
  5. Furnish complete with Large Stadium Marker Caddy; one per classroom; plastic magnetic holder with divider; able to hold up to 14 markers, cleaner, and eraser.
- B. Vinyl-Fabric-Faced Tack Boards: Provide mildew-resistant, washable, vinyl fabric.
1. Backing: Make panels rigid by factory laminating cork face sheet under pressure to 1/4-inch-thick hardboard backing.
  2. Vinyl Facing: See Finish Schedule for vinyl type and color or if not in Finish Schedule then as specified by Architect from manufacturer's full range.
- C. Customized Magnetic Display Rails:
1. 1-1/2 inch wide x 1/8 inch thick x 54 inches long 430 stainless steel sheared and edged, polished. Attached to walls at 32 inches on center with flat head screws set flush to bar surface.

## 2.3 ACCESSORIES

- A. Mounting Clips: Concealed aluminum clips allowing markerboards to be attached and removed without special tools.

## 2.4 FABRICATION

- A. Assembly: Provide factory-assembled markerboard and tackboard units, except where field-assembled units are required.
1. Make joints only where total length exceeds maximum manufactured length. Fabricate with the minimum number of joints, balanced around the center of the board, as acceptable to the Architect.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Deliver factory-built marker board, tack board and bulletin board units completely assembled in one piece without joints, wherever possible. Where dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to the Architect. When overall dimensions require delivery in separate units, pre-fit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.
- B. Install units in locations and at mounting heights indicated and in accordance with the manufacturer's instructions. Keep perimeter lines straight, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for a complete installation.
- C. Coordinate job-site assembled units with grounds, trim, and accessories. Join parts with a neat, precision fit.

### **3.2 ADJUST AND CLEAN**

- A. Verify that accessories required for each unit have been properly installed and that operating units function properly.
- B. Clean units in accordance with the manufacturer's instructions. Break in marker boards only as recommended by the manufacturer.

**END OF SECTION**

## SECTION 10 1200

### DISPLAY CASES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Illuminated display cases.
- B. Related Sections include the following:
  - 1. Division 26 Sections for wiring and other electrical work associated with illuminated display cases.

##### 1.3 DEFINITIONS

- A. Display Case: Glazed cabinet with adjustable shelves.

##### 1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for bulletin boards and display cases.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. Show location of tack assembly seams and joints.
  - 2. Include sections of typical trim members.
- C. Samples for Selection: For units with factory-applied color finishes as follows:
  - 1. Actual sections of tack assembly.
  - 2. Section of header panel for color selection.
- D. Maintenance Data: For tack assemblies to include in maintenance manuals.

##### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative of manufacturer for installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain each type of product through one source from a single manufacturer.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of bulletin boards and display cases and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
  - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.



- D. Fire-Test-Response Characteristics: Provide fabrics with the surface-burning characteristics indicated, as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

## **1.6 PROJECT CONDITIONS**

- A. Field Measurements: Verify recessed openings by field measurements before fabrication and indicate measurements on Shop Drawings.
  - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating products without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Hardboard: AHA A135.4, tempered.
- B. Particleboard: ANSI A208.1, Grade 1-M-1.
- C. Extruded-Aluminum Bars and Shapes: ASTM B 221 (ASTM B 221M), Alloy 6063.
- D. Aluminum Tubing: ASTM B 429, Alloy 6063.
- E. Clear Tempered Glass: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality q3, with exposed edges seamed before tempering, and 6 mm thick, unless otherwise indicated.
- F. Fasteners: Provide screws, bolts, and other fastening devices made from same material as items being fastened, except provide hot-dip galvanized, stainless-steel, or aluminum fasteners for exterior applications. Provide types, sizes, and lengths to suit installation conditions. Use security fasteners where exposed to view.

### **2.2 DISPLAY CASE**

- A. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. ADP/Lemco, Inc.
  - 2. Best-Rite Manufacturing.
  - 3. Claridge Products & Equipment, Inc.
- B. Wall-Mounted Aluminum-Framed Cabinet: Factory-fabricated cabinet with manufacturer's standard, 2-by-2-inch nominal, tubular aluminum frame; with hardwood-veneer-plywood top and bottom panels, tack assembly over plywood on back inside surface, glazed side panels, and glazed doors at front.

- C. Glazed Sliding Doors: 6-mm-thick tempered glass; unframed; with extruded-aluminum top and bottom track; supported on nylon or ball-bearing rollers; with plastic top guide and rubber bumpers. Equip each door with ground finger pull and adjustable cylinder lock with two keys.
  - 1. Number of Doors: As indicated on Drawings.
- D. Shelves: 6-mm-thick tempered glass; supported on adjustable shelf standards and supports.
  - 1. Shelf Width: 12 inches.
  - 2. Number of Shelves: As indicated on Drawings.
- E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04102; with shelf brackets, B04112; recess mounted in rear surface. Provide standards full height of display case.
- F. Tack Surface: Match Section 10 1100 "Visual Display Boards".
- G. Lighting: Manufacturer's standard LED strip lighting.
- H. Size: 48 inches H x 96 inches L x 12 inches D.

## 2.4 FABRICATION

- A. Fabricate display cases to requirements indicated for dimensions, design, and thickness and finish of materials.
- B. Use metals and shapes of thickness and reinforcing to produce flat surfaces, free of oil canning, and to impart strength for size, design, and application indicated.
- C. Fabricate cabinets and door frames with reinforced corners, mitered to a hairline fit, with no exposed fasteners.
- D. Fabricate shelf standards plumb and at heights to align shelf brackets for level shelves.

## 2.5 ALUMINUM FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- E. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine walls, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of work.
  - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. General: Install units in locations and at mounting heights indicated on Drawings, or if not indicated, at heights as directed by Architect. Keep perimeter lines straight, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
- B. Display Cases: Attach units to wall surfaces with concealed clips, hangers, or grounds fastened at not more than 16 inches o.c. Secure both top and bottom of display cases to walls.
- C. Install display case shelving level and straight.

### **3.4 ADJUSTING AND CLEANING**

- A. Adjust doors to operate smoothly without warp or bind and contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.
- B. Replace with new any damaged finishes.

**END OF SECTION**

## SECTION 10 1400

### SIGNAGE

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following types of signs:
  - 1. Panel signs.
    - a. Interior room identification signs.
    - b. Handicap accessibility signs.
    - c. Handicapped entry signs.
    - d. Maximum occupancy load signs
    - e. Graphic panel signs.
  - 2. Vinyl Graphics - Pressure Sensitive.
  - 3. Parking and Traffic Signs.
    - a. Parking signs – handicapped.
    - b. Site directional signs.
  - 4. Building Identification and Plaques.
    - a. Dimensional letters and numbers.
    - b. Building address.
  - 5. Illuminated LED monument sign.

##### 1.3 SUBMITTALS

- A. Product Data: Provide product data for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Shop drawings: Provide shop drawings showing fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories, and installation details.
  - 1. Provide message list for each sign required, including large-scale details of wording and lettering layout.
- C. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.
  - 1. Samples for selection of color, pattern, and texture:
    - a. Cast Acrylic Sheet and Plastic Laminate: Manufacturer's color charts consisting of actual sections of material including the full range of colors available for each material required.

##### 1.4 QUALITY ASSURANCE

- A. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.

- B. Single-Source Responsibility: For each separate sign type required, obtain signs from one source of a single manufacturer.
- C. Handicapped Accessibility: Provide signs which are in conformance with the requirements of ANSI A117.1-1998 and the Americans with Disabilities Act of 1990 (ADA).
- D. Design Concept: The Drawings indicate sizes, profiles, and dimensional requirements of signs and are based on the specific types and models indicated. Sign units by other manufacturers may be considered provided deviations in dimensions and profiles do not change the design concept as judged by the Architect. The burden of proof of equality is on the proposer.

## **1.5 DELIVERY AND HANDLING**

- A. Delivery: Provide protective covering or crating as recommended by the manufacturer to protect sign components and surfaces against damage during transportation and delivery.
- B. Handling: Handle signs carefully to prevent breakage, surface abrasion, denting, soiling, and other defects. Comply with the manufacturer's written handling instructions for unloading components subject to damage.
  - 1. Inspect sign components for damage on delivery.
  - 2. Do not install damaged sign components.
  - 3. Repair minor damage to signs, provided the finished repair is equal in all respects to the original work and is approved by Architect; otherwise, remove and replace damaged sign components.

## **1.6 PROJECT CONDITIONS**

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

## **1.7 WARRANTY**

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Warranty Period: 5 years.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include but are not limited to the following:
  - 1. Manufacturers of Panel Signs:
    - a. Allotech, Inc.
    - b. Andco Industries
    - c. ASI Sign Systems, Inc.
    - d. Best Manufacturing Company.
    - e. Kroy Architectural Signing

- f. Thomas & Sons LLC
- g. Vomar Products, Inc.
- h. Gemini
- i. A. R. K. Ramos
- j. Interpretive Graphics

## 2.2 MATERIALS

- A. Raised Graphic and Tactile Signs: Provide chemically welded, adhesive mounted or glued and mechanically engraved graphics, text and Braille panels that comply with requirements indicated for materials, thickness, colors, designs, shapes sized and details of construction.
  - 1. Panel signs shall comply with applicable provisions of the ADA Accessibility Guidelines (ADAAG) and ICC / ANSI A177.1/98 including 0.0312 inch raised tactile characters, 4.0 inch pictograms, 0.625 inch upper case text, sans serif type styles and Grade II Braille shall be positioned directly beneath the text.
- B. Cast Acrylic Sheet: Provide cast (not extruded or continuous cast) methyl methacrylate monomer plastic sheet, in sizes and thicknesses indicated, with a minimum flexural strength of 16,000 psi when tested according to ASTM D 790, with a minimum allowable continuous service temperature of 176 degrees F, and of the following general types:
  - 1. Opaque Sheet: Where sheet material is indicated as "opaque," provide colored opaque acrylic sheet in colors and finishes as selected from the manufacturer's standards.

## 2.3 PANEL SIGNS

- A. General: Provide panel signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
  - 1. Produce smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch 1.5 mm measured diagonally.
- B. Basis-of-Design Product: ASI Sign Systems, Inc.; ADA-Ready, In Touch System or a comparable product of one of the other manufacturers listed.
- C. Materials:
  - 1. Acrylic: Non-glare acrylic sheet, continuously processed with a matte finish that complies with ANS Z97.1-1984 Safety Glazing requirements.
  - 2. Vinyl: 3M Scotchcal film Series 220/Series 225 precision plotted in sizes and colors indicated.
- D. Unframed Panel Signs: Fabricate signs with edges mechanically and smoothly finished to comply with the following requirements:
  - 1. Edge Condition: Square cut.
  - 2. Corner Condition: Square.
  - 3. Depth: 0.25 inch thickness.
  - 4. Panel Appearance: As selected by Architect.
  - 5. Color: As selected by Architect from manufacturers full range of colors.
  - 6. Surface Texture: As selected by Architect.
  - 7. Letter Style: Arial.
  - 8. Letter Height: As scheduled.

- E. Graphic Content and Style: Provide sign copy that complies with requirements indicated in the Sign Schedule for size, style, spacing, content, mounting height and location, material, finishes, and colors of signage.
  - 1. Provide signage indicating handicap entry at each set of ADA accessible entry doors into facility.
  - 2. Provide one wall mounted sign per door or set of doors throughout building with permanent ADA text.
    - a. Provide signs with cutouts and removable inserts (one (1) per sign) with permanent ADA text.
  - 3. Provide maximum occupancy load signs in assembly rooms as required by code.
  
- F. Tactile and Braille Copy: Manufacturer's standard process for producing copy complying with ADA Accessibility Guidelines and ICC/ANSI A117.1. Text shall be accompanied by Grade 2 braille. Produce precisely formed characters with square cut edges free from burrs and cut marks.
  - 1. Raised-Copy Thickness: Not less than 1/32 inch.
  
- G. Changeable Message Inserts: Fabricate signs to allow insertion of changeable messages in the form of transparent covers with paper inserts printed by Owner.
  - 1. Furnish paper and software for creating text and symbols for IBM compatible computers for Owner production of paper inserts.
  - 2. Furnish paper cut-to-size for changeable message insert.
  
- H. Colored Coatings: For copy and background colors, provide Pantone Matching System (PMS) colored coatings, including inks and paints, which are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are nonfading for application intended.
  
- I. Metal Finishes: Comply with NAAMM "Metal Finishes Manual" for finish designations and applications recommendations.
  
- J. Aluminum Finishes: Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.
  - 1. Baked-Enamel Finish: AA-M4xC12C42R1x (Mechanical Finish: Manufacturer's standard, other nondirectional textured; Chemical Finish: Chemical conversion coating, acid chromate-fluoride-phosphate pretreatment; Organic Coating: as specified below). Apply baked enamel in compliance with paint manufacturer's specifications for cleaning, conversion coating, and painting.
    - a. Organic Coating: Thermosetting-modified acrylic enamel primer/topcoat system complying with AAMA 603.8 except with a minimum dry film thickness of 1.5 mils, medium gloss.
      - 1) Color: As selected by the Architect from the manufacturer's standard colors.

## 2.4 ACRYLIC PANEL SIGNAGE

- A. Where shown on Drawings, provide custom acrylic graphic panels.
  
- B. Description:
  - 1. Two 1/8-inch thick clear acrylic panels with graphic images UV printed on #2 surface. Laminate acrylic sheets together using full coverage, clear, sheet adhesive.
  
- C. Mounting: Direct screw-mounted to walls.

## 2.5 GLASS PANEL SIGNAGE

- A. Where shown on Drawings, provide custom glass graphic panels.
- B. Description:
  - 1. 3/8-inch thick fully tempered glass panels with graphic images UV printed on #2 surface.
- C. Mounting: Stainless steel stand-offs, depths as shown on Drawings. Provide complete system, including stand-off bases, caps, and fasteners.
  - 1. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
    - a. Manufacturer: C.R. Laurence Co., Inc.
    - b. Product: 1/2 inch Brushed Stainless Standoff system.

## 2.6 PRESSURE SENSITIVE VINYL GRAPHICS

- A. Provide graphics on pressure-sensitive vinyl film where indicated on Drawings.
  - 1. 3M 'Scotchcal' permanent opaque graphic film or equivalent, as judged by Architect.
  - 2. Graphics provided by Architect in digital format; transfer to vinyl as digital print.
  - 3. Sizes and Shapes: As indicated on Drawings.

## 2.7 EXTERIOR DIRECTIONAL AND PARKING SIGNS

- A. Panel Signs: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
  - 1. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally.
- B. Steel Posts: 0.120-inch, galvanized, seamless, square steel posts in length adequate for mounting method specified. Include post caps, fillers, spacers, junction boxes, access panels, and related accessories required for a complete installation. Comply with the following requirements for post shape, finish, and mounting method indicated:
  - 1. Post Size: 2 by 2 inches square.
  - 2. Anchor: Provide a single breakaway anchor, 24 inches in length to accommodate post
  - 3. Post Mounting Method: Provide sign posts of length required for permanent installation by direct-burial mounting method.
- C. Sign Panels: Provide smooth, even, level sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner.
  - 1. Unframed Single-Sheet Panels: Provide unframed single-sheet sign panels with edges mechanically and smoothly finished to conform to the following:
    - a. Panel Material: 0.08-inch thick aluminum sheet.
      - 1) Panel Finish: Manufacturer's standard semigloss finish with UV inhibitors.
    - b. Edge Condition: Square cut.
    - c. Corner Condition: 1/2 inch radius corners.



- D. **Graphic Content and Style:** Provide sign copy that complies with the requirements indicated for size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices.
1. **Copy on Panels:** Apply computer-generated adhesive graphics to panel. Graphics to be engineer grade vinyl. Apply as per manufacturer's recommendations
    - a. Provide signage indicating handicap parking at all handicap parking spaces.
    - b. Provide directional signage on site for bus, automobile and pedestrian access.
- E. **Fabrication:**
1. **General:** Provide manufacturer's standard single-post, single-panel-type post and panel signs. The completed sign assembly shall consist of a message panel supported on 1 post. Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
    - a. Allow for thermal movement resulting from a maximum ambient temperature change (range) of 100 degrees F. Design, fabricate, and install post and panel sign assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners.
      - 1) Base design on actual surface temperatures of metals due to both solar heat gain and nighttime-sky heat loss.
    - b. **Welded Connections:** Comply with AWS standards for recommended practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded surfaces of welding flux and dress on exposed and contact surfaces.
    - c. Mill joints to a tight, hairline fit. Form joints exposed to the weather to exclude water penetration.
    - d. Preassemble signs in the shop to the greatest extent possible to minimize field assembly. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in a location not exposed to view after final assembly.
    - e. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.
  2. **Posts:** Fabricate posts to lengths required for mounting method indicated.
    - a. **Direct Burial:** For permanent sign installation, provide posts 36 inches longer than height of sign to permit direct embedment in concrete foundations.
  3. **Panels:** Form panels to required size and shape. Comply with requirements indicated for design, dimensions, finish, color, and details of construction.
    - a. Coordinate dimensions and attachment methods to produce message panels with closely fitting joints. Align edges and surfaces with one another in the relationship indicated.
    - b. Increase metal thickness or reinforce with concealed stiffeners or backing materials as required to produce surfaces without distortion, buckles, warp, or other surface deformations.
    - c. Continuously weld joints and seams, unless other methods are indicated; grind, fill, and dress welds to produce smooth, flush, exposed surfaces with welds invisible after final finishing.

## **2.8 DIMENSIONAL LETTERS AND NUMBERS**

- A. Cast Letters and Numbers: Form individual letters and numbers by casting. Produce characters with smooth, flat faces, sharp corners, and precisely formed lines and profiles, free from pits, scale, sand holes, or other defects. Cast lugs into the back of characters and tap to receive threaded mounting studs. Comply with requirements indicated for finish, style, and size.
1. Metal: Aluminum.
  2. Building Name: Provide letters of size and style as indicated on the drawings or if not indicated provide 18 inch high letters for the building name and 10 inch high letters for the building address. Attach to of exterior building as directed by Architect.
  3. Monument Sign: 6 inches high.

## **2.9 ILLUMINATED LED MONUMENT SIGN**

- A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
1. Manufacturer: Daktronics Electronic Message Centers.
  2. Product: 16 mm full color display; 3.15 feet x 8.4 feet; 2 faced.
- B. Framed Hollow-Box-Type Panels:
1. Panel Material: 0.090-inch thick aluminum sheet.
  2. Panel Finish: High-performance organic coating; color as selected by Architect.
  3. LED: Removable modules.
    - a. Pitch: 16mm.
    - b. Configuration: 1R 1G 1B, full color.
    - c. Furnish complete with control software.
- C. Coordinate installation of LED panels with cast-in-place concrete and steel tube frame system as shown on Drawings.

## **2.10 LANDSCAPING SIGNAGE**

- A. As detailed on Drawings with a 1/4 inch stainless steel backing plate and a 1/2 inch phenolic sign made of high pressure laminates.
1. Mounting: Mount the high pressure laminate to the stainless steel plate using stainless steel vandal-resistant bolts threaded into the phenolic sign.
- B. Quantity: Provide 6 signs.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
1. Install signs level, plumb, and at the height indicated, with sign surfaces free from

- B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using the methods indicated below:
1. Interior Wall Signs: Install signs as indicated on the drawings or if not indicated then as follows: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches (75 mm) of sign without encountering protruding objects or standing within swing of door.
    - a. Mounting Method – smooth surfaces: Use two-face tape. Mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.
    - b. Mounting Method – rough or vinyl surfaces: Use silicone-adhesive mounting. Attach signs to irregular, porous, or vinyl-covered surfaces.
    - c. Signs Mounted on Glass: Use two-face tape. Provide matching opaque plate (plate to be of the same color and texture as the sign.) on opposite side of glass to conceal mounting materials.
- C. Acrylic Panel Signs: Attach to wall surfaces with stand-off system, as shown on Drawings.
- D. Vinyl Graphics - Pressure Sensitive: Apply to substrate as per manufacturer's written recommendations.
- E. Exterior Directional and Parking Signs:
1. Excavation: In firm, undisturbed or compacted soil, drill or (using a post-hole digger) hand-excavate holes for each post to the minimum diameter recommended by sign manufacturer, but at least 4 times the largest post cross-section.
    - a. Excavate hole depths approximately 3 inches lower than required post bottom, with bottom of posts set at least 36 inches below finished grade.
  2. Setting Posts: Center and align posts in holes 3 inches above bottom of excavation.
    - a. Protect portion of posts aboveground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Check posts for vertical and top alignment and hold in position until concrete has achieved its initial set.
- F. Dimensional Letters and Numbers: Mount letters and numbers using standard fastening methods recommended by the manufacturer for letter form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish letter spacing and to locate holes for fasteners. Letters are to be offset from wall surface.

### **3.2 CLEANING AND PROTECTION**

- A. After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

**END OF SECTION**

## SECTION 10 2113.14

### STAINLESS-STEEL TOILET COMPARTMENTS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. Section includes stainless-steel toilet compartments configured as toilet enclosures and urinal screens.
- B. Related Requirements:
  - 1. Section 05 5000 "Metal Fabrications" for supports that attach post-to-ceiling screens to overhead structural system.
  - 2. Section 06 1053 "Miscellaneous Carpentry" for blocking overhead support of post-to-ceiling screens.
  - 3. Section 10 2800 "Toilet and Bath Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories mounted on toilet compartments.

##### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.
- B. Shop Drawings: For toilet compartments.
  - 1. Include plans, elevations, sections, details, and attachment details.
  - 2. Show locations of reinforcements for compartment-mounted grab bars and locations of blocking for surface-mounted toilet accessories.
  - 3. Show locations of centerlines of toilet fixtures.
  - 4. Show locations of floor drains.
  - 5. Show ceiling grid, ceiling-mounted items, and overhead support or bracing locations.
- C. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
  - 1. Each type of material, color, and finish required for toilet compartments, prepared on 6-inch-square Samples of same thickness and material indicated for Work.
  - 2. Each type of hardware and accessory.

##### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet compartments to include in maintenance manuals.

## **1.5 MAINTENANCE MATERIAL SUBMITTALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Door Hinges: One hinge with associated fasteners.
  - 2. Latch and Keeper: One latch and keeper with associated fasteners.
  - 3. Door Bumper: One door bumper with associated fasteners.
  - 4. Door Pull: One door pull with associated fasteners.
  - 5. Fasteners: Ten fasteners of each size and type.

## **1.6 PROJECT CONDITIONS**

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

## **PART 2 - PRODUCTS**

### **2.1 PERFORMANCE REQUIREMENTS**

- A. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.

### **2.2 STAINLESS-STEEL TOILET COMPARTMENTS**

- A. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Accurate Partitions Corp.
  - 2. American Specialties, Inc.
  - 3. Bobrick Washroom Equipment, Inc.
  - 4. Columbia Partitions as manufactured by PSISC
  - 5. Crane Plumbing; Sanymetal.
  - 6. DesignRite.
  - 7. Global Partitions.
  - 8. Knickerbocker Partition Corporation.
  - 9. Metpar Corp.
- B. Toilet-Enclosure Style: Overhead braced.
- C. Urinal-Screen Style: Post to ceiling.

- D. Door, Panel, and Pilaster Construction: Seamless, metal facing sheets pressure laminated to core material; with continuous, interlocking molding strip or lapped-and-formed edge closures; corners secured by welding or clips and exposed welds ground smooth. Exposed surfaces shall be free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections.
  - 1. Core Material: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of 1 inch for doors and panels and 1-1/4 inches for pilasters.
  - 2. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units of size and material adequate for panel to withstand applied downward load on grab bar of at least 250 lbf, when tested according to ASTM F 446, without deformation of panel.
  - 3. Tapping Reinforcement: Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.
  
- E. Urinal-Screen Construction:
  - 1. Flat-Panel Urinal Screen: Matching panel construction.
  
- F. Facing Sheets and Closures: Stainless-steel sheet of nominal thicknesses as follows:
  - 1. Pilasters, Braced at Both Ends: Manufacturer's standard thickness, but not less than 0.038 inch.
  - 2. Panels: Manufacturer's standard thickness, but not less than 0.031 inch.
  - 3. Doors: Manufacturer's standard thickness, but not less than 0.031 inch.
  - 4. Flat-Panel Urinal Screens: Thickness matching the panels.
  
- G. Pilaster Shoes and Sleeves (Caps): Stainless-steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.
  
- H. Urinal-Screen Post: Manufacturer's standard post design of material matching the thickness and construction of pilasters or 1-3/4-inch- square, aluminum tube with satin finish Insert requirement; with shoe and sleeve (cap) matching that on the pilaster.
  
- I. Brackets (Fittings):
  - 1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.
  
- J. Stainless-Steel Finish: No. 4 bright, directional polish on exposed faces. Protect exposed surfaces from damage by application of strippable, temporary protective covering before shipment.

## 2.3 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.
  - 1. Hinges: Manufacturer's minimum 0.062-inch- thick stainless steel paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees or continuous, cam type that swings to a closed or partially open position, either option allowing emergency access by lifting door. Mount with through-bolts.
  - 2. Latch and Keeper: Manufacturer's heavy-duty surface-mounted cast-stainless-steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through-bolts.

3. Coat Hook: Manufacturer's heavy-duty combination cast-stainless-steel hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories. Mount with through-bolts.
  4. Door Bumper: Manufacturer's heavy-duty rubber-tipped cast-stainless-steel bumper at out-swinging doors. Mount with through-bolts.
  5. Door Pull: Manufacturer's heavy-duty cast-stainless-steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel anchors compatible with related materials.

## 2.4 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M.
- B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M).
- C. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- D. Stainless-Steel Castings: ASTM A 743/A 743M.

## 2.5 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories and solid blocking within panel where required for attachment of toilet accessories.
- B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- C. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at tops and bottoms of posts. Provide shoes and sleeves (caps) at posts to conceal anchorage.
- D. Door Size and Swings: Unless otherwise indicated, provide 24-inch- wide in-swinging doors for standard toilet compartments and 36-inch- wide out-swinging doors with a minimum 32-inch- wide clear opening for compartments designated as accessible.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
  - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
  - 1. Maximum Clearances:
    - a. Pilasters and Panels: 1/2 inch.
    - b. Panels and Walls: 1 inch.
  - 2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
    - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
    - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

### **3.3 ADJUSTING**

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

**END OF SECTION**



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## SECTION 10 2220

### ACCORDION FOLDING PARTITIONS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Electrically operated accordion folding partitions.
- B. Related Sections:
  - 1. Section 03 3000 "Cast-in-Place Concrete" for concrete floor tolerances.
  - 2. Section 05 5000 "Metal Fabrications" for metal framing and supports.
  - 3. Division 26 Sections for electrical power supply wiring and motor.

##### 1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Acoustical Performance: Provide accordion folding partitions tested by a qualified independent testing agency for the following acoustic properties according to the following test method:
  - 1. Sound Transmission Requirements: Accordion folding partition tested for laboratory sound transmission loss performance according to ASTM E 90, determined by ASTM E 413 and rated for a STC plus or minus 1 as follows:
    - a. Sound Transmission Class (STC): 39.

##### 1.4 SUBMITTALS

- A. Product data for each type of accordion folding partition and accessory specified. Include installation methods for each type of substrate.
- B. Shop drawings showing location and extent of accordion folding partitions. Include plans, elevations, large-scale details of anchorages, and accessory items. Indicate unit conditions at openings, location and installation requirements for hardware, and direction of travel.
  - 1. Include location and installation requirements for electric operators.
- C. Wiring diagrams detailing power and control wiring. Differentiate between manufacturer-installed and field-installed wiring. Include motor size and voltage.
- D. Samples for selection purposes in the form of manufacturer's color charts showing the full range of colors, textures, and patterns available for each finish indicated.
- E. Maintenance data for **electric operating devices** to include in the "Operating and Maintenance Manual" specified in Division 1.
- F. Maintenance data for partition to include in the "Operating and Maintenance Manual" specified in Division 1.
  - 1. Precautions for cleaning materials and methods that could be detrimental to finishes and performance.

## **1.5 QUALITY ASSURANCE**

- A. Installer Qualifications: Engage an experienced Installer who is certified in writing by the accordion folding partition manufacturer as qualified to install the manufacturer's partition systems.
- B. Surface-Burning Characteristics: Provide a partition finish face with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or other testing and inspecting agencies acceptable to authorities having jurisdiction.
  - 1. Flame Spread: 25 or less.
  - 2. Smoke Developed: 450 or less.

## **1.6 MAINTENANCE**

- A. Maintenance Instructions: Submit manufacturers printed instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated use conditions. Include precautions against materials and methods which may be detrimental to finishes and performance.
- B. Operating Instructions: Submit manufacturers printed operating instructions which shall cover all pertinent topics, IE: alarm modes, alarm resets, battery and AC power problems and resets.
- C. Mechanical Installation: Submit manufacturers printed information covering track, chain, motor and all other hardware.
- D. Electrical Instructions: Submit manufacturers printed information covering connections to control boxes, batteries, relays, power supplies, alarm circuits, communication circuits, key switches, doors, etc.
- E. Setup/Program Instructions: Submit complete manufacturers setup instructions covering any hardware setup for controls and any programming that may be required using computer or hand held remote programming tools. Any computer software required and any hand held programming devices shall be furnished complete with operating instructions for each.
- F. Customer Training: Upon completion of the project, the contractor shall spend the necessary time with the Owner's maintenance personnel to adequately instruct them on the operation and maintenance of the partition system, including access to multiple doors setup from one location. These training sessions shall be scheduled at times convenient to the School District and shall be conducted at the project.

## **1.7 EXTRA MATERIALS**

- A. Extra Materials: Furnished from same production run as materials installed. Package materials with protective covering and identify with labels describing contents. Deliver extra materials to Owner.
  - 1. Finish Face Material: Furnish a quantity of full-size units equal to 5 percent of the amount installed.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Basis of Design: Contract Documents are based on products listed below to establish a standard of quality. Other available manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
  - 1. Manufacturer: Modernfold, Inc., a Dorma Group Company.
  - 2. Product: Soundmaster Model SM 8.
  
- B. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
  - 1. Kwik-Wall Company
  - 2. Moderco Partitions
  - 3. Modernfold, Inc., a Dorma Group Company
  - 4. Won-Door Corporation.

### **2.2 SUSPENSION SYSTEMS**

- A. Carriers: Four-wheel ball-bearing carriers at lead post and two-wheel ball-bearing carriers at intermediate spacing as required for type, size, and weight of partition.
  
- B. Tracks: Manufacturer's standard extruded aluminum or steel track with factory-applied corrosion-resistant finish. Track deflection, independent of structural supporting system, shall be no more than 80 percent of bottom clearance.
  - 1. Track: Recessed with pre-finished ceiling guard.

### **2.3 POSTS AND SEALS**

- A. Lead Posts and Jamb Posts: Formed to provide rigidity for partition and light seal at adjacent construction.
  
- B. Seals: Perimeter sweep strips for each side, top, and bottom, providing continuous contact with head and sill surfaces for positive light and sound seal. Include manufacturer's standard male and female sound and light seal at lead post and jamb.

### **2.4 FINISH FACING**

- A. General: Provide finish facings that comply with indicated fire-test-response characteristics; factory attached or applied to accordion folding partitions over acoustical core with appropriate backing, using concealed fasteners; designed to be field replaceable.
  - 1. Application: Apply facings free of air bubbles, wrinkles, blisters, and other defects, with vertical invisible seams, and with no gaps or overlaps. Horizontal butted edges or seams are not permitted. Tightly secure and conceal raw and salvage edges of facing for finished appearance.
  - 2. Material: Outer covering shall be Class 'A' rated in accordance with ASTM E-84. Material to be manufacturer's standard vertically ribbed wall carpet.
  - 3. Color: As indicated in the Finish Schedule or if not in Finish Schedule then selected by Architect from manufacturer's full range.

## **2.5 ELECTRICAL OPERATORS**

- A. Operators: Factory-assembled electric operation system, electric motor, speed reducer, chain drive, controls, and other accessories required for operation. Include wiring from motor control to motor.
  - 1. Motors: High-starting torque, reversible, constant-duty, NEMA Class A insulated electric motor with thermal overload protection. Manufacturer's standard motor size and voltage for specified accordion folding partition size and type indicated.
    - a. 208 volts, three-phase, 60 Hz.
  - 2. Remote Control Switches: Two key-operated, constant-pressure control stations located remotely from each other on opposite sides and opposite ends of the partition run. Wire in series to require simultaneous activation of both key stations to operate partition. Factory-assembled electric operation system including control box, key switch, motor drive unit, and accessories required for operation. Include wiring from motor control to motor and two keys per station.
  - 3. Limit Switches: At both extremes of travel preventing overtravel.
  - 4. Emergency Release Mechanism: To disengage electric motor drive system permitting manual operation in event of power or mechanical failure.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine flooring for compliance with requirements for installation tolerances and other conditions affecting the performance of accordion folding partitions.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. Install accordion folding partitions and accessories complying with ASTM E 557 after other finishing, including painting, has been completed.
- B. Repair or replace accordion folding partitions within areas where test results indicate partitions do not comply with requirements, and retest partitions.

### **3.3 ADJUSTING**

- A. Lubricate bearings and sliding parts. Adjust to ensure smooth, easy operation.

### **3.4 CLEANING**

- A. Clean all accordion folding partition surfaces and adjacent surfaces. Avoid abrasive cleaners or solutions containing corrosive solvents. Use cleaning materials recommended by the manufacturer.

**END OF SECTION**

## SECTION 10 2239

### OPERABLE PANEL PARTITIONS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Electrically operated, continuously hinged panel partitions.
- B. Related Sections include the following:
  - 1. Section 03 3000 "Cast-in-Place Concrete" for concrete floor tolerances
  - 2. Section 05 5000 "Metal Fabrications" for metal framing and supports
  - 3. Division 26 Sections for electrical power supply wiring and motor connections.

##### 1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Acoustical Performance: Provide operable panel partitions tested by a qualified testing agency for the following acoustical properties according to test methods indicated:
  - 1. Sound Transmission Requirements: Operable panel partition assembly tested in a full-scale opening, 14 by 9 feet, for laboratory sound transmission loss performance according to ASTM E 90, determined by ASTM E 413, and rated for not less than the STC indicated.
    - a. Sound Transmission Class (STC): 52 for continuously hinged panels.

##### 1.4 SUBMITTALS

- A. Product Data: Material descriptions, construction details, finishes, installation details, and operating instructions for each type of operable panel partition, component, and accessory specified. Include data on acoustical performance, surface-burning characteristics, and durability.
- B. Shop Drawings: Show location and extent of operable panel partitions. Include plans, elevations, sections, details, attachments to other construction, and accessories. Indicate dimensions; weights; conditions at openings and for storage; and required installation, storage, and operating clearances. Indicate location and installation requirements for hardware and track, and direction of travel. Show blocking to be provided by others.
  - 1. Electric Operator: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, and mounting arrangements.
  - 2. Wiring Diagrams: Detail wiring for power and control systems and differentiate between manufacturer-installed and field-installed wiring and between components provided by operable panel partition manufacturer and those provided by others.
- C. Setting Drawings: For embedded items and cutouts required in other work, including support beam punching template.

- D. Samples for Selection: Manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.
  - 1. Include similar Samples of accessories involving color selection.
- E. Maintenance Data: For the following to include in maintenance manuals specified in Division 1:
  - 1. Panel face finishes and finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
  - 2. Seals, hardware, track, carriers, and other operating components.
  - 3. For electric operator.

## **1.5 QUALITY ASSURANCE**

- A. Installer Qualifications: An experienced installer who is certified in writing by the operable panel partition manufacturer as qualified to install the manufacturer's partition systems for work similar in material, design, and extent to that indicated for this Project.
- B. Fire-Test-Response Characteristics: Provide operable panel partitions with the following fire-test-response characteristics, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
  - 1. Surface-Burning Characteristics: As follows, per ASTM E 84:
    - a. Flame Spread: 25 or less.
    - b. Smoke Developed: 450 or less.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Protectively package and sequence panels in order for installation. Clearly mark packages and panels with numbering system used on Shop Drawings. Do not use permanent markings on panels.

## **1.7 PROJECT CONDITIONS**

- A. Field Measurements: Verify operable panel partition openings and storage arrangements by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening and storage dimensions and proceed with fabricating operable panel partitions without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to established dimensions.

## **1.8 MAINTENANCE**

- A. Maintenance Instructions: Submit manufacturers printed instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated use conditions. Include precautions against materials and methods which may be detrimental to finishes and performance.

- B. Operating Instructions: Submit manufacturers printed operating instructions which shall cover all pertinent topics, IE: alarm modes, alarm resets, battery and AC power problems and resets.
- C. Mechanical Installation: Submit manufacturers printed information covering track, chain, motor and all other hardware.
- D. Electrical Instructions: Submit manufacturers printed information covering connections to control boxes, batteries, relays, power supplies, alarm circuits, communication circuits, key switches, doors, etc.
- E. Setup/Program Instructions: Submit complete manufacturers setup instructions covering any hardware setup for controls and any programming that may be required using computer or hand held remote programming tools. Any computer software required and any hand held programming devices shall be furnished complete with operating instructions for each.
- F. Customer Training: Upon completion of the project, the contractor shall spend the necessary time with the Owner's maintenance personnel to adequately instruct them on the operation and maintenance of the partition system, including access to multiple doors setup from one location. These training sessions shall be scheduled at times convenient to the Owner and shall be conducted at the project.

## **1.9 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Panel-Face Finish Material: Furnish full-width in quantity to cover both sides of two panels when installed.

## **PART 2 - PRODUCTS**

### **2.1 PRODUCTS AND MANUFACTURERS**

- A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other available manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
  - 1. Manufacturer: Modernfold Inc.
  - 2. Products: Acousti-Seal 900 Series, continuously hinged with #20 track.
- B. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Kwik-Wall
  - 2. Modernfold, Inc.

### **2.2 MATERIALS**

- A. Steel Frame: Steel sheet, not less than 0.0598-inch nominal specified thickness for uncoated steel.



## 2.3 OPERABLE PANEL PARTITIONS

- A. Panel Construction: Provide top reinforcement as required to support panel from suspension components and provide reinforcement for hardware attachment. Fabricate panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.
- B. Dimensions: Fabricate operable panel partitions, from manufacturer's standard sizes, to form an assembled system of dimensions indicated on Drawings and verified by field measurements.
- C. Trimless Edges: Fabricate exposed panel edges so finish facing wraps uninterrupted around panel, covering edge and resulting in an installed partition with facing visible on vertical panel edges, without trim, for minimal sightlines at panel-to-panel joints.
- D. Trim: Manufacturer's standard aluminum trim, finished as follows:
  - 1. Painted, as selected by Architect from manufacturer's full range.
- E. Hardware: Manufacturer's standard as required to operate operable panel partition and accessories; with decorative, protective finish.

## 2.4 SEALS

- A. General: Provide types of acoustical seals indicated that produce operable panel partitions complying with acoustical performance requirements and the following:
  - 1. Seals made from materials and profiles that minimize sound leakage.
  - 2. Seals fitting tight at contact surfaces and sealing continuously between adjacent panels and between operable panel partition perimeter and adjacent surfaces, when operable panel partition is extended, closed, and in place.
- B. Vertical Seals: Roll-formed steel astragals, with tongue and groove configuration in each panel edge. Aluminum astragals or rigid plastic astragals are not acceptable.
- C. Horizontal Top Seals: Continuous-contact, extruded-PVC or PVC-faced, mechanical, retractable, constant-force-contact seal exerting uniform constant pressure on track when extended.
- D. Horizontal Bottom Seals: PVC-faced, mechanical, retractable, constant-force-contact seal exerting uniform constant pressure on floor when extended, ensuring horizontal and vertical sealing and resisting panel movement.
  - 1. Automatically Operated (Continuously Hinged Panels): Extension and retraction of bottom seal automatically operated by movement of partition, with operating range not less than the 1 inch operating clearance between retracted seal and floor finish.

## 2.5 FINISH FACING

- A. General: Provide finish facings that comply with indicated fire-test-response characteristics and that are factory applied to operable panel partitions with appropriate backing, using mildew-resistant nonstaining adhesive as recommended by facing manufacturer's written instructions.
  - 1. Apply one-piece, seamless facings free from air bubbles, wrinkles, blisters, and other defects, with no gaps or overlaps. Horizontal butted edges or seams are not permitted. Tightly secure and conceal raw and selvage edges of facing for finished appearance.
  - 2. Where facings with directional or repeating patterns or directional weave are indicated, mark facing top and attach facing in same direction.
- B. Reinforced vinyl with woven backing weighing not less than 21 ounces per lineal yard.
  - 1. Color: As selected by Architect from manufacturer's full range of colors.

## 2.6 SUSPENSION SYSTEMS

- A. Suspension Tracks: Steel or aluminum with adjustable steel hanger rods for overhead support, designed for type of operation, size, and weight of operable panel partition indicated. Size track to support partition operation and storage without damage to suspension system, operable panel partitions, or adjacent construction. Limit track deflection to no more than 0.10 inch between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.
  - 1. Panel Guide: Aluminum; finished with factory-applied, decorative, protective finish.
  - 2. Head Closure Trim: As required for acoustical performance; with factory-applied, decorative, protective finish.
- B. Carriers: Trolley system as required for configuration type, size, and weight of partition and for easy operation; with ball-bearing wheels.
  - 1. Multidirectional Carriers: Capable of negotiating 90-degree L, T, and X intersections without track switches.
- C. Track Intersections, Switches, and Accessories: As required for type of operation, storage, track configuration, and layout indicated for operable panel partition, and compatible with partition assembly specified. Fabricate track intersections and switches from steel or aluminum.
- D. Aluminum Finish: Mill finish or manufacturer's standard, factory-applied, decorative finish, unless otherwise indicated.
- E. Steel Finish: Factory-applied, corrosion-resistant, protective coating, unless otherwise indicated.

## 2.7 ELECTRIC OPERATORS

- A. General: Provide factory-assembled electric operation system of size and capacity recommended and provided by operable panel partition manufacturer for partition specified; with electric motor and factory-prewired motor controls, speed reducer, chain drive, remote-control stations, control devices, and accessories required for proper operation. Include wiring from motor control to motor. Coordinate operator wiring requirements and electrical characteristics with the building electrical system.
- B. Comply with NFPA 70.

- C. Control Equipment: Complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6.
- D. Electric Motors: High-starting-torque, reversible, continuous-duty, Class A insulated, electric motors, complying with NEMA MG 1, with thermal-overload protection; sized to start and operate size and weight of operable panel partition without exceeding nameplate ratings or considering service factor.
  - 1. Service Factor: According to NEMA MG 1, unless otherwise indicated.
  - 2. Enclosure: Open dripproof, unless otherwise indicated.
  - 3. Motors Smaller than 1/2 hp: Single phase, 60 Hz.
  - 4. Motors 1/2 hp and Larger: Polyphase, 60 Hz.
- E. Remote-Control Stations: Two single-key-operated, constant-pressure control stations located remotely from each other on opposite sides and opposite ends of partition run. Wire in series to require simultaneous activation of both key stations to operate partition. Each three-position control station labeled "Open," "Close," and "Stop." Provide two keys per station.
- F. Obstruction-Detection Devices: Provide each motorized operable panel partition with automatic safety sensor indicated. Activation of sensor immediately causes operator to shut off motor.
  - 1. Sensor Edge: Contact-pressure-sensitive safety edge along partition's leading edge.
- G. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop operable panel partition at fully extended and fully stacked positions.
- H. Emergency Release Mechanism: Quick disconnect-release of electric-motor drive system, permitting manual operation in the event of operating failure.
- I. Provide "Safe Path" safety system. System to surround area on both sides of operable panel partition with a blanket of vertical infrared beams. Beam travel to be a minimum of 12 feet high on each side of wall. Beam coverage to create a shield that will span the entire length of the operable wall. The shield is to be comprised of interwoven fingers on infrared light that, when penetrated will cause the partition to cease operation.
  - 1. A single infrared beam systems running along the base of the operable panel partition, sensing noses or safety mats are not acceptable and will not be approved.

## 2.8 ACCESSORIES

- A. Pass Doors: Fabricated to comply with recommendations of ANSI A117.1. Swinging door built into and matching panel materials, construction, acoustical qualities, finish and thickness, complete with frames and operating hardware. Hinges finished to match other exposed hardware.
  - 1. Single Pass Door: 36 by 84 inches, with the following:
    - a. Door Seals: Mechanically operated floor seal on panels containing pass doors.
    - b. Latch: Friction latch and flush pulls.
    - c. Lock: Key-operated lock cylinder, keyed to master key system, operable from both sides of door. Include two keys per lock.
    - c. Vision Light: 6 inch x 36 inch; fully tempered glass; frame to match other exposed hardware.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable panel partitions. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. General: Comply with ASTM E 557, operable panel partition manufacturer's written installation instructions, Drawings, and approved Shop Drawings.
- B. Install operable panel partitions and accessories after other finishing operations, including painting, have been completed.
- C. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.

### **3.3 ADJUSTING**

- A. Adjust operable panel partitions to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware, electric operator and other moving parts.
- B. Pass Doors: Adjust to operate smoothly and easily, without binding or warping. Check and readjust operating hardware. Confirm that latches and locks engage accurately and securely without forcing or binding.

### **3.4 CLEANING AND PROTECTION**

- A. Clean soiled surfaces, fabric facing, metal surfaces, on completing installation of operable panel partitions, to remove dust, loose fibers, fingerprints, adhesives, and other foreign materials according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, which ensure operable panel partitions are without damage or deterioration at time of Substantial Completion.
- C. Replace panels that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

### **3.5 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain operable panel partitions.
  - 1. Test and adjust seals, hardware, carriers, tracks, pass doors, pocket doors, operators, controls, safety devices, and other operable components. Replace damaged or malfunctioning operable components.
  - 2. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
  - 3. Review data in maintenance manuals. Refer to Division 1 Section "Contract Closeout."
  - 4. Schedule training with Owner, through Architect, with at least seven days' advance notice.

**END OF SECTION**

## SECTION 10 2613

### CORNER GUARDS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes stainless steel corner guards.

##### 1.3 SUBMITTALS

- A. Product Data: Product data for each type of wall and corner guard specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Shop Drawings: Shop drawings detailing fabrication and installation of wall and corner guards. Include plans, elevations, and large-scale details showing layout and types required. Show anchorages and accessory items.

##### 1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing wall and corner guards similar to that indicated for this Project and that has a record of successful in-service performance.
- B. Design Criteria: The drawings indicate sizes, profiles, and dimensional requirements of the various items of wall and corner guards and are based on the specific types and models indicated. Similar equipment by other manufacturers may be considered, provided deviations in dimensions and profiles are minor and do not change the design concept as judged by the Architect. The burden of proof of equality is on the proposer.

#### PART 2 - PRODUCTS

##### 2.1 STAINLESS STEEL CORNER GUARDS

- A. Surface-Mounted, Metal Corner Guards: Fabricated from 1-piece, formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.
  - 1. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other available manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept expressed in the Contract Documents is not changed, as judged by the Architect.
    - a. Manufacturer: Western Fabricating LLC

2. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:
  - a. Balco, Inc.
  - c. Boston Retail Products.
  - d. Construction Specialties, Inc.
  - e. IPC Door and Wall Protection Systems; Division of InPro Corporation.
  - f. Pawling Corporation.
  - g. Western Fabricating, LLC>
3. Material: Stainless steel, Type 304.
  - a. Thickness: Minimum 0.0625 inch.
  - b. Finish: Directional satin, No. 4.
4. Wing Size: Nominal 1 inch by 1 inch.
5. Corner Radius: 1/8 inch.
6. Mounting: Adhere to wall with adhesive as recommended by the corner guard manufacturer.
7. Size: 48 inches high (above wall base) and full height (top of base to ceiling) as indicated on Drawings.

### **PART 3 - EXECUTION**

#### **3.1 PREPARATION**

- A. General: Coordinate installation of wall and corner guards indicated to be attached to concrete or masonry, and furnish anchoring devices with templates, diagrams, and instructions for their installation.
  1. Coordinate delivery of anchoring devices to Project site to avoid delaying progress.

#### **3.2 INSTALLATION**

- A. General: Comply with manufacturer's detailed instructions for installing wall and corner guards.
- B. Wall/Corner Guards: Install wall surface protection units plumb, level, and true to line without distortions.
  1. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished work.

#### **3.3 ADJUST AND CLEAN**

- A. After installation, restore marred, abraded surfaces to the original condition.

**END OF SECTION**

## SECTION 10 2800

### TOILET AND BATH ACCESSORIES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following toilet and bath accessories to be provided by the Contractor:
  - 1. Sanitary napkin disposal.
  - 2. Diaper-changing station
  - 3. Under-lavatory guards.
  - 4. Mop and broom holder.
- B. This Section includes the following toilet and bath accessories to be furnished by the Owner but installed by the Contractor:
  - 1. Soap dispensers
  - 2. Paper towel dispensers.
  - 3. Sanitary napkin dispensers.
  - 4. Toilet paper dispensers.

##### 1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.
- B. Samples: For each accessory item to verify design, operation, and finish requirements.
  - 1. Approved full-size Samples will be returned and may be used in the Work.
- C. Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.
- D. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required. Use designations indicated in the Toilet and Bath Accessory Schedule and room designations indicated on Drawings in product schedule.
- E. Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

##### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.



- B. Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated in the Toilet and Bath Accessory Schedule.
  - 1. Products of other manufacturers listed in Part 2 with equal characteristics, as judged solely by Architect, may be provided.
  - 2. Do not modify aesthetic effects, as judged solely by Architect, except with Architect's approval. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

## 1.5 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

## 1.6 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Manufacturer's Mirror Warranty: Written warranty, executed by mirror manufacturer agreeing to replace mirrors that develop visible silver spoilage defects within minimum warranty period indicated.
  - 1. Minimum Warranty Period: 15 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Toilet and Bath Accessories:
    - a. A & J Washroom Accessories, Inc.
    - b. American Specialties, Inc.
    - c. Bobrick Washroom Equipment, Inc.
    - d. Bradley Corporation.
  - 2. High-Speed Dryers: Dyson.
  - 3. Underlavatory Guards:
    - a. Brocar Products, Inc.
    - b. Truebro, Inc.

### 2.2 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch minimum nominal thickness, unless otherwise indicated.
- B. Brass: ASTM B 19, leaded and unleaded flat products; ASTM B 16, rods, shapes, forgings, and flat products with finished edges; ASTM B 30, castings.

- C. Sheet Steel: ASTM A 366/A 366M, cold rolled, commercial quality, 0.0359-inch minimum nominal thickness; surface preparation and metal pretreatment as required for applied finish.
- D. Galvanized Steel Sheet: ASTM A 653/A 653M, G60.
- E. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service), nickel plus chromium electrodeposited on base metal.
- F. Baked-Enamel Finish: Factory-applied, gloss-white, baked-acrylic-enamel coating.
- G. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

## **2.3 FABRICATION**

- A. General: Names or labels are not permitted on exposed faces of accessories. On interior surface not exposed to view or on back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.
- B. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.
- C. Recessed Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors and access panels with full-length, stainless-steel hinge. Provide anchorage that is fully concealed when unit is closed.
- D. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Coordinate and provide required blocking for Owner-furnished fixtures.
- B. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- C. Install grab bars to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

### **3.2 ADJUSTING AND CLEANING**

- A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

### 3.3 TOILET AND BATH ACCESSORY SCHEDULE

- A. Grab Bars:
1. Basis of Design: Bobrick B-6806 Series, length as indicated on Drawings; B-6861 Series at shower stall.
  2. Stainless-Steel Nominal Thickness: Minimum 0.05 inch.
  3. Mounting: Concealed with manufacturer's standard flanges and anchors.
  4. Gripping Surfaces: Manufacturer's standard slip-resistant texture.
  5. Outside Diameter: 1-1/2 inches for heavy-duty applications.
- B. Sanitary Napkin Disposal Unit:
1. Basis of Design: ASI, 20852.
  2. Surface Mounted Sanitary Waste Receptacle shall hold 1 gallon of waste material. Cabinet full top cover shall be drawn seamless and receptacle body shall be formed seamless and shall have bowed front face and gently radiused front vertical edges.
  3. Full Top Door: 22 gauge type 304 stainless steel alloy 18-8 with satin finish and shall be attached to the cabinet at back with a concealed full-width 9/64 inch diameter heavy-duty stainless steel multi-staked piano hinge. Structural assembly of body and door components shall be of welded construction.
  4. Unit shall be 22 gauge type 304 stainless steel alloy 18-8 with satin finish and shall have contoured cover finger lift relief and be protected during shipment with PVC film that is easily removable after installation. Receptacle full top edge is hemmed with return to inside. Receptacle shall have no exposed fastening devices or spot-welded seams. Receptacle shall be screw mounted to wall or partition through concealed keyhole slots provided through rear panel.
  5. Furnish three cases (500 bags per case) disposable wax paper liners for Owner's attic stock.
- C. Mop and Broom Holder:
1. Basis of Design: Bobrick, B-224x36.
  2. Mop and Broom Holder with Utility Shelf: 36-inch- long unit fabricated of minimum nominal 0.05-inch- thick stainless steel with shelf; support brackets for wall mounting; three hooks for wiping rags; four spring-loaded, rubber hat, cam-type, mop/broom holders mounted on front of shelf; and approximately 1/4-inch- diameter, stainless-steel rod suspended beneath shelf for drying rags.
  3. Provide at least one mop and broom holder at each janitor's closet and mop sink.
- H. Under-Lavatory Guard:
1. Insulating Piping Coverings: White, antimicrobial, molded-vinyl covering for supply and drain piping assemblies intended for use at accessible lavatories to prevent direct contact with and burns from piping. Provide components as required for applications indicated with flip tops at valves that allow service access without removing coverings.
  2. Provide under-lavatory guard where lavatory piping is exposed below the counter or with wall hung lavatories.
- I. Shower Curtain Rod:
1. Basis of Design: Bobrick, B-6047 Series, length as indicated on Drawings.
  2. Shower curtain rod shall be type-304, 18-gauge stainless steel with satin finish and have outside diameter of 1-1/4 inch. One-piece, die-formed flanges shall be type-304, 20-gauge (1.0mm) stainless steel with satin finish.

- J. Shower Curtain:
1. Shower Curtain: Water repellent, anti-microbial, 100 percent polyester material with ultrasonic water sheeting bottom hem. Provide with matching "Flex-On" color rings sized for shower curtain rod.
    - a. Size: Minimum 6 inches wider than opening by 72 inches high.
    - b. Color: As selected by Architect from manufacturer's full range.
    - c. Quantity: Provide two (2) shower curtains for each shower as indicated. Furnish unused curtain to Owner for attic stock.
    - d. Basis of Design: Litchfield, Hookless Shower Curtain; Arcs & Angles, [www.arcsandangles.com](http://www.arcsandangles.com).
      - 1) Pattern: 'Plainweave'
      - 2) Fabric: 100% polyester, water repellent with ultrasonically cut bottom hem.
      - 3) Size: As indicated on the Drawings.
      - 4) Color: White with chrome rings.
- K. Folding Shower Seat:
1. Basis of Design: Bobrick, B-5181
  2. Shower Seat: Heavy-duty hinged seat designed to fold up against wall when not in use; with stainless-steel support braces, hinges, frame, and fasteners; of all-welded construction.
  3. Configuration: L-shaped seat, designed for wheelchair access.
  4. Seat Material: Phenolic or polymeric composite of slat-type or one-piece construction. Color as selected by Architect from manufacturer's full range.
- L. Clothes Hook:
1. Basis of Design: Bobrick, B-983
  2. Surface-mounted, maximum security clothes hook (secured from the front) shall be constructed of type 304 stainless steel with satin finish and have square 4/8 inch deep back plate. Faceplate shall be 14 - gauge with drawn, one piece seamless construction. Hook shall snap down for safety if excessively loaded. Furnish with tamper resistant mounting screws.

- M. Diaper Changing Station:
1. Basis of Design: Contract Documents are based on product specified below to establish a standard of quality. Other acceptable manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
    - a. Manufacturer: Koala Kare Products
    - b. Product: KB110-SSRE Horizontal Recessed Mounted Stainless Steel Baby Changing Station.
  2. Characteristics: 18 gage, type 304 satin stainless steel exterior finish with high-density grey polyethylene interior; recess-mounted. Equip with pneumatic cylinder for controlled opening and closing of bed. Secure bed to 11 gage back plate with concealed, full-length steel-on-steel hinge. Unit shall have "Microban" embedded into the plastic material. Bed shall have smooth concave changing area with a nylon safety strap and two hooks for bags or purses. Unit shall have a built-in liner dispenser, universal instruction graphics and safety measures in 6 languages.
  3. Code Conformance: ANSI S117.1 "Accessible and Usable Buildings and Facilities", ASTM F 2285-04 "Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use", ANZI Z535.4 "Product Safety Signs and Labels", ASTM G21 "Antifungal" and ASTM G22 "Antibacterial Standards". Units shall comply with ADA regulations when installed.

**END OF SECTION**

## SECTION 10 2926.13

### CUSTOM RESTROOM SINKS

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract Documents, including General and Supplementary Conditions and Division 01 Specification sections apply to work of this section.

##### 1.2 SUMMARY

- A. Section includes custom-built stainless steel sinks for restroom.
- B. Related Sections:
  - 1. Division 22 sections for faucets, drains, and other related plumbing equipment and connections.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Submit one complete set, prior to fabrication, of shop fabricator's product information and installation instructions for each item.
- B. Shop Drawings: Submit one complete set of documents, prior to fabrication, of shop drawings showing layouts, elevations, sections and details of custom fabricated work. Show plan layouts at 1/4" scale, elevations at 1/2" scale and details at 1 1/2" or larger scales, as required.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Coordination Drawings: Submit one complete electronic set, prior to fabrication, of manufacturer's or shop fabricator's product information and installation instructions.
  - 1. Indicate locations of new sinks and connections to utilities.
  - 2. Key equipment using same designations as indicated on Drawings.
  - 3. Include plans and elevations; clearance requirements for equipment access and maintenance; details of equipment support; and utility service characteristics.

##### 1.4 PRODUCT HANDLING

- A. Protect metal finishes from damage during shipping, storage, handling, installation and construction of other work in the same space. Wrap and crate each item of equipment as needed for protection from damage. Covers exposed stainless steel surfaces with self-adhesive protective paper, of a type recommended by the metal manufacturer, and do not remove until work is installed and ready for cleaning and start-up.

#### PART 2 – PRODUCTS

##### 2.1 MATERIALS

- A. Metal: Stainless Steel (S/S): AISI Type 302/304, hardest workable temper, No. 4 directional polish.

- B. Solid Surface Material: Solid Surface Material: Homogenous sheet composed of a blend of natural minerals and 100 percent acrylic resin (methyl methacrylate) complying with ANSI Z124.3 and Z124.6, Type 6.
  - 1. Acceptable Solid Surface/Quartz Surface Manufacturers: Subject to compliance with requirements of Contract Documents, provide solid surface materials by one of the manufacturers listed below. If not listed, submit as a substitution according to the Conditions of the Contract and provisions of Division 1 sections.
    - a. Radianz, Staron Solid Surfaces; Lotte Chemicals.
- C. Joint Materials: Sealant: 1-part or 2-part, polyurethane or silicone based, liquid elastomeric sealant, non-solvent release type, Shore A hardness of 30 except 45 if subject to traffic.
- D. Sound Deadening: Heavy-bodied resinous coating, filled with granulated cork or other resilient material, compounded for permanent, non-flaking adhesion to metal in a 1/8 inch thick coating.

## 2.2 FABRICATION OF METALWORK

- A. General Fabrication Requirements:
  - 1. Remove burrs from sheared edges of metalwork, ease the corners and smooth to eliminate cutting hazard. Bend sheets of metal at not less than the minimum radius required avoiding grain-separation in the metal. Maintain flat, smooth surfaces without damage to finish. Reinforce metal at locations of hardware, anchorage and accessory attachments, wherever metal is less than 14 gage or requires mortise application. Conceal reinforcements to the greatest extent possible. Weld in place on concealed faces.
  - 2. Where fasteners are permitted, provide Phillips head, flat or oval head machine screws. Cap threads with acorn nuts unless fully concealed in inaccessible construction, and provide nuts and lock washers unless metal for tapping is at least 12 gauge. Match fastener head finish with finish of metal fastened.
  - 3. Provide removable panels for access to mechanical and electrical service connections that are concealed behind or within sink enclosure, but only where access is not possible and not indicated through other work.
- B. Metal and Gauges:
  - 1. Except as otherwise indicated, fabricate exposed metalwork of stainless steel; fabricate the following components from the gauge of metal indicated:
    - a. Sinks: 14 Gauge.
    - b. Gusset Plates: 10 gauge
- C. Work-Surface Fabrication:
  - 1. Fabricate metal work surfaces by forming and welding to provide seamless construction, using welding rods matching sheet metal, grinding and polishing. Where necessary for disassembly, provide waterproof gaskets draw-type joints with concealed bolting.
  - 2. Sound deaden underside of metal work-surfaces, including sinks and similar units, with a coating of sound deadening material. Hold coating back 3" from sanitary edges that are open for cleaning.
- D. Field Joints: For any field joint required because of size of fixture, butt-joint, reinforce on underside with angles of same material, bolt together with non-corrosive bolts and nuts, field weld, grind and polish.

- E. Sinks:
  1. Construct sinks of 14 gauge stainless steel No. 4 finish inside and outside. Form back, bottom, front, of one piece with ends, partitions, welded into place.
  2. Cove interior vertical and horizontal corners of each tub not less than 1/4 inch radius, die formed. Outside ends of drain boards to have roll rim risers not less than 2-1/2 inch high.
  3. Sink Drains: Install in center of bottom of each sink bowl 1-1/2 inch I.P.S. quick opening pop-up lever type drain approximately 4 inches high, with a 4-1/2 inch flange with lugs, and fit with 3-1/8 inch stainless steel strainer plate.
  4. Slope bottom of sink bowls toward outlet. Include chrome-plated tailpiece and trap.
  
- F. Workmanship:
  1. Best quality in the trade. Field verify dimensions, check measurements before fabricating; conform all items to dimensions of building; neatly fit around pipes, offsets and other obstructions.
  2. Fabricate only in accordance with approved shop drawings, showing all pipes, obstructions to be built around, and location of Utility Requirements and services.
  3. Where equipment is exposed to view, provide enclosure of service lines, operating components and mechanical and electrical devices.
  
- G. Enclosures: Provide enclosures, including panels, housings and skirts for service lines, operating components and mechanical and electrical devices associated with the Food Service Equipment, except as specifically indicated to be "open".
  
- H. Casework: Provide box-type face framing

**PART 3 – EXECUTION**

**3.1 INSPECTION AND PREPARATION**

- A. The installer must examine the rough in of mechanical and electrical services by others, and the conditions under which the work is to be done and must verify dimensions of the services and substrates before fabricating the work. Notification of unsatisfactory conditions for the proper installation must be made in writing to the General Contractor.
- B. Do not proceed with the fabrication and installation until unsatisfactory dimensions and conditions have been corrected in a manner acceptable to the installer.
- C. Bidder is to verify site conditions to allow for the physical installation of each piece of equipment. Any consideration or associated cost required allowing for the installation is to be the responsibility of the bidder.

**3.2 INSTALLATION**

- A. Water Connections: Install water connections and outlets at each item of equipment, with air gaps, vacuum breakers and similar provisions to comply with governing regulations, but not less than compliance with ANSI Standards A40.4 and A40.6.
- B. Service Line and Equipment Connections: Refer to division 22 sections for piping connections and piping systems.



- C. Jointing and Anchoring:
1. Set each items of non-mobile and non-portable equipment securely in place and level and adjust to correct height. Anchor to supporting substrate where indicated and where required for sustained operation and use without shifting or dislocation. Conceal anchorage wherever possible. Adjust counter tops and other work surfaces to a level tolerance of 1/6" (maximum offset, and plus-or-minus on dimensions, and maximum variation in 2'-0" run from level of indicated slope).
  2. Complete field assemble joints in the work (joints which cannot be completed in the shop) by welding, bolting and gaskets, or similar methods as indicated. Grind welds smooth and restore finish. Set or trim flush, except for "T" gaskets as indicated.
  3. Treat enclosed spaces (inaccessible after equipment installation) by covering horizontal surfaces with powdered borax at a rate of 4 oz. per sq. ft.
  4. Install closure plates and strips where required, with joints coordinated with units of equipment.
  5. Install sealant and gaskets all around each unit to make joints air tight, waterproof, vermin-proof, and sanitary for cleaning purposes. In general, make sealed joints not less than 1/8 inch wide, and stuff with backer rod to shape sealant bead properly, at 1/4 inch depth.
  6. Shape exposed surfaces of sealant slightly concave, with edges flush with faces of material joint. At internal-corner joints, apply sealant or gasket to form a sanitary cove, of not less than 3/8" radius. Provide sealant-filled or gasket joints up to 3/8" joint width; metal closure strips for wider joints, with sealant application each side of strips. Anchor gaskets mechanically or with adhesives to prevent displacement.

### **3.3 CLEANING:**

- A. After completion of installation, and completion of other major work in Food Service areas, remove protective coverings, if any, and clean Food Service Equipment, internally and externally.
- B. Restore exposed and semi-exposed finishes to remove abrasions and other damages; polish exposed-metal surfaces; touch-up painted surfaces. Replace work that cannot be successfully restored.
- C. Remove and dispose off site crating and packaging material.

**END OF SECTION**

## SECTION 10 4313

### DEFIBRILLATOR CABINET

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. Section Includes recessed defibrillator cabinet.
- B. Final location will be determined in field by Architect and Owner.

##### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-mounting method and relationships of box and trim to surrounding construction.
- B. Shop Drawings: For defibrillator cabinet.
  - 1. Include plans, elevations, sections, details, and attachments to other work.

##### 1.4 COORDINATION

- A. Coordinate size of defibrillator cabinet to ensure that type and capacity of Owner-provided defibrillator is accommodated.
- B. Coordinate size and location of defibrillator cabinet with wall depths.

#### PART 2 - PRODUCTS

##### 2.1 DEFIBRILLATOR CABINET

- A. Cabinet Type: Suitable for AED device.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Manufacturer: Cardiac Science Brand
    - b. Product: Semi-recessed Standard Size AED Wall Cabinet, 14.25 x 14.25 x 7 D inches inside dimensions, trim dimensions 17.5 x 17.5 x 2.5 inches.

- B. Cabinet Construction: Nonrated.
- C. Cabinet Material: Cold-rolled steel sheet.
  - 1. Shelf: Same metal and finish as cabinet.
- D. Recessed Cabinet:
  - 1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).
- E. Cabinet Trim Material: Steel sheet.
- F. Door Material: Steel sheet.
- G. Door Style: Fully glazed panel with frame.
- H. Door Glazing: Clear transparent acrylic sheet.
- I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
  - 1. Provide projecting lever handle with magnetic door catch latch.
  - 2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
- J. Accessories:
  - 1. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.
    - a. Identify defibrillator cabinet with the words "AED – AUTOMATED EXTERNAL DEFIBRILLATOR."
      - 1) Location: Applied to cabinet glazing.
      - 2) Application Process: Silk-screened or pressure-sensitive vinyl letters.
      - 3) Lettering Color: Red.
      - 4) Orientation: Horizontal.
  - 2. Alarm: Manufacturer's standard alarm that actuates when defibrillator cabinet door is opened and that is powered by batteries.
    - a. 85 dB alarm; capable of being disarmed by key included with cabinet.

- K. Materials:
1. Cold-Rolled Steel: ASTM A1008/A1008M, Commercial Steel (CS), Type B.
    - a. Finish: Baked enamel, TGIC polyester powder coat, HAA polyester powder coat, epoxy powder coat, or polyester/epoxy hybrid powder coat, complying with AAMA 2603.
    - b. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    - c. Color: White.
  2. Transparent Acrylic Sheet: ASTM D4802, Category A-1 (cell-cast sheet), 3 mm thick, with Finish 1 (smooth or polished).

## **2.2 FABRICATION**

- A. Defibrillator Cabinet: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
1. Weld joints and grind smooth.
  2. Miter corners and grind smooth.
  3. Provide factory-drilled mounting holes.
- B. Cabinet Door: Fabricate door according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

## **2.3 GENERAL FINISH REQUIREMENTS**

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of defibrillator cabinet from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish defibrillator cabinet after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine walls and partitions for suitable framing depth and blocking where recessed cabinet will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Prepare recess for recessed defibrillator cabinet as required by type and size of cabinet and trim style.

### **3.3 INSTALLATION**

- A. General: Install defibrillator cabinet in location and at mounting height indicated or, if not indicated, at height acceptable to authorities having jurisdiction.
- B. Defibrillator Cabinet: Fasten cabinet to structure, square and plumb.

### **3.4 ADJUSTING AND CLEANING**

- A. Remove temporary protective coverings and strippable films, if any, as defibrillator cabinet is installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust defibrillator cabinet door to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of defibrillator cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace defibrillator cabinet that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by defibrillator cabinet and mounting bracket manufacturers.
- E. Replace defibrillator cabinet if it has been damaged or has deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

**END OF SECTION**

## SECTION 10 4400

### FIRE PROTECTION SPECIALTIES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes:
  - 1. Portable fire extinguishers:
    - a. Multipurpose dry chemical type.
    - b. Wet chemical type to be used in the kitchen area.
  - 2. Fire protection cabinets for Portable fire extinguishers:
  - 3. Fire protection accessories.
- B. Related Sections include the following:
  - 1. Section 10 1400 "Signage" for directional signage to out-of-sight fire extinguishers and cabinets.
  - 2. Section 11 4000 "Food Service Equipment" for fire extinguishing systems provided as part of exhaust hoods.

##### 1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection specialties.
  - 1. Fire Extinguishers: Include rating and classification.
  - 2. Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Samples for Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of cabinet finish indicated.

##### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire extinguishers and cabinets through one source from a single manufacturer.
- B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers."
- C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

##### 1.5 COORDINATION

- A. Coordinate size of cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Basis of Design (Cabinets): Contract Documents are based on products listed below to establish a standard of quality. Other available manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
  - 1. Manufacturer: J.L Industries, part of the Activar Construction Products Group, Inc.
  - 2. Product: Ambassador, 1017W10 - 1 1/2 inch Semi-Recessed cabinet with prime-painted steel rolled trim with a contemporary vertical clear acrylic window
  
- B. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Portable Fire Extinguishers:
    - a. Badger; Div. of Figgie Fire Protection Systems.
    - b. Buckeye Fire Equipment Company.
  - 2. Fire Protection Cabinets:
    - a. Amerex.
    - b. General Accessory Manufacturing Co.
    - c. J.L. Industries, part of the Activar Construction Products Group.
    - d. Larsen's Manufacturing Company.
    - e. Potter-Roemer; Div. of Smith Industries, Inc.

### **2.2 MATERIALS**

- A. Cold-Rolled Steel Sheet: Carbon steel, complying with ASTM A 366/A 366M, commercial quality, stretcher leveled, temper rolled.

### **2.3 PORTABLE FIRE EXTINGUISHERS**

- A. General: Provide fire extinguishers as indicated in the Summary above.
  
- B. Multipurpose Dry-Chemical Type: UL-rated 4-A:60-B:C, 10-lb nominal capacity, in enameled-steel container.
  
- C. Wet-Chemical Type: UL-rated 2-A:1-B:C:K, 1.6-gallon nominal capacity, with potassium acetate-based chemical in stainless-steel container; with pressure-indicating gage.

### **2.4 FIRE PROTECTION CABINETS**

- A. Cabinet Construction: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.
  - 1. Cabinet Metal: Enameled steel sheet.
  
- B. Cabinet Type: Suitable for fire extinguisher.
  
- C. Cabinet Mounting: Suitable for the following mounting conditions:
  - 1. Recessed or Semi-Recessed: Cabinet box recessed in walls of sufficient depth to suit style of trim indicated.

- D. Cabinet Trim Style: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.
  - 1. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend)
- E. Cabinet Trim Material: Manufacturer's standard, as follows:
  - 1. Steel sheet.
- F. Door Material: Manufacturer's standard, as follows:
  - 1. Steel sheet.
- G. Door Glazing: Manufacturer's standard, as follows:
  - 1. Acrylic: Smooth or textured sheet, as follows:
    - a. Thickness: 6 mm.
- H. Door Style: Manufacturer's standard design, as follows:
  - 1. Vertical acrylic panel with frame.
- I. Door Construction: Fabricate doors according to manufacturer's standards, of materials indicated, and coordinated with cabinet types and trim styles selected.
  - 1. Provide minimum 1/2-inch- thick door frames, fabricated with tubular stiles and rails, and hollow-metal design.
- J. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide door pull and replaceable break-away plastic cam latch. Provide concealed or continuous-type hinge permitting door to open 180 degrees.

## **2.5 ACCESSORIES**

- A. Mounting Brackets: Manufacturer's standard steel, designed to secure extinguisher, of sizes required for types and capacities of extinguishers indicated, with plated or baked-enamel finish.
  - 1. Provide brackets for extinguishers not located in cabinets.
  - 2. Provide brackets for extinguishers located in cabinets.
- B. Door Locks: Provide cylinder lock, with all cabinets keyed alike.
- C. Identification: Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location. Locate as indicated by Architect.
  - 1. Identify bracket-mounted extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to wall surface.
  - 2. Identify fire extinguisher in cabinet with the words "FIRE EXTINGUISHER" applied to door.
    - a. Application Process: Silk-screened.
    - b. Lettering Color: Red.
    - c. Orientation: Vertical.

## **2.6 COLORS AND TEXTURES**

- A. Colors and Textures: As selected by Architect from manufacturer's full range for these characteristics.



## **2.7 FINISHES, GENERAL**

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Cabinet and Door Finishes:
  - 1. Provide manufacturer's standard baked-enamel paint for interior of cabinets and doors.
  - 2. Prime exterior of cabinets and doors to receive field-applied finish.

## **2.8 STEEL FINISHES**

- A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.
- B. Epoxy primer: Immediately after cleaning and pre-treating, apply manufacturer's standard white epoxy primer coated finish.
  - 1. Color: Painted to match wall see Division 9 Section "Painting".

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine walls and partitions for suitable framing depth and blocking where fully-recessed cabinets are to be installed.
- B. Examine fire extinguishers for proper charging and tagging.
  - 1. Remove and replace damaged, defective, or undercharged units.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. Comply with manufacturer's written instructions for installing fire protection specialties.
- B. Install in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
  - 1. Prepare recesses for cabinets as required by type and size of cabinet and trim style.
  - 2. Fasten mounting brackets to structure and cabinets, square and plumb.
  - 3. Fasten cabinets to structure, square and plumb.

### **3.3 ADJUSTING, CLEANING, AND PROTECTION**

- A. Adjust cabinet doors that do not swing or operate freely.
- B. Refinish or replace cabinets and doors damaged during installation.
- C. Provide final protection and maintain conditions that ensure that cabinets and doors are without damage or deterioration at the time of Substantial Completion.

**END OF SECTION**

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## SECTION 10 5113

### METAL LOCKERS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following: (Locker sizes are width x depth x height)
  - 1. Kitchen (Staff) Lockers: Single tier, 12 inches x 12 inches x 72 inches.
- B. Related Sections include the following:
  - 1. Section 03 3000 "Cast in Place Concrete" for concrete bases
  - 2. Section 06 1053 "Miscellaneous Rough Carpentry" for wood furring and grounds.

##### 1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of locker and bench.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.
  - 1. Show locker fillers, trim, base, sloping tops, and accessories. Include locker-numbering sequence.
- C. Samples for Selection: Manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.
- D. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals specified in Division 1.

##### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain locker units and accessories through one source from a single manufacturer.

##### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver lockers until spaces to receive them are clean, dry, and ready for locker installation.
- B. Protect lockers from damage during delivery, handling, storage, and installation.

##### 1.6 COORDINATION

- A. Coordinate size and location of concrete bases. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers listed below. If not listed, submit as a substitution according to the Conditions of the Contract and the provisions of Division 1 Sections.
1. General Storage Systems; division of North American Steel.
  2. Hadrian Manufacturing, Inc.
  3. Interior/Medart.
  4. List Industries, Inc.
  5. Republic Storage Systems Co., Inc.
  6. WEC Manufacturing.

### **2.2 MATERIALS**

- A. Cold-Rolled Steel Sheet: ASTM A 366/A 366M, matte finish, suitable for exposed applications, and stretcher leveled or roller leveled to stretcher-leveled flatness.
- B. Galvanized Steel Sheet: ASTM A 653/A 653M, commercial quality, G60 (Z180) coating designation; mill phosphatized; suitable for exposed applications, and stretcher leveled or roller leveled to stretcher-leveled flatness.
- C. Electrolytic Zinc Coated Steel Sheet: ASTM A 591/A 591M, commercial quality, coating Class C; mill phosphatized; suitable for exposed applications; and stretcher leveled or roller leveled to stretcher leveled flatness.
- D. Fasteners: Zinc- or nickel-plated steel, slotless-type exposed bolt heads, and self-locking nuts or lock washers for nuts on moving parts.

### **2.3 LOCKERS**

- A. Body: Form backs, tops, bottoms, sides, and intermediate partitions from steel sheet; flanged for double thickness at back vertical corners. Comply with the following:
1. Back-Material Sheet Thickness: 24 gauge (0.0239 inch).
  2. Side-Material Sheet Thickness: 24 gauge (0.0239 inch).
  3. Exposed Ends: Form exposed ends of non-recessed lockers from minimum 16 gauge (0.0598-inch) thick steel sheet.
- B. Frames: Form channel frames from minimum 16 gauge (0.0598-inch) thick steel sheet; lapped and welded at corners. Form continuous integral door strike on vertical frame members. Provide resilient bumpers to cushion door closing.
1. Latch Hooks: Form from minimum 0.1046-inch- thick steel; welded or riveted to door frames.
- C. Doors: One-piece steel sheet, formed into channel shape at vertical edges and flanged at right angles at top and bottom edges. Fabricate to prevent springing when opening or closing, and to swing 180 degrees. Comply with the following:
1. Sheet Thickness: 16 gauge (0.0598 inch) minimum.
  2. Reinforcement: Brace or reinforce inner face of doors more than 15 inches wide.
  3. Hinge Side Stiffeners: Full-height channel shaped stiffener fabricated from 18 gauge (0.0478-inch) thick, cold-rolled steel sheet; welded to inner face of doors at hinge side.

4. Acoustical Treatment: Fabricate lockers for quiet operation with manufacturer's standard rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact.
    - a. Sound-Dampening Panels: Manufacturer's standard, designed to stiffen door surface and reduce sound levels when door is slammed, of die-formed metal with full perimeter flange and sound-dampening material. Spot weld panel to inside of door.
  5. Door Style: Unperforated panel.
- D. Shelves: Provide hat shelf in single-tier units; fabricated from minimum 24 gauge (0.0239 inch) thick, formed steel sheet; flanged on all edges.
- E. Continuous Hinges: Manufacturer's standard, steel continuous hinge mounted to door and frame.
- F. Recessed Handle and Latch: Manufacturer's standard housing, formed from 20 gauge (0.0359 inch) thick nickel-plated steel or stainless steel, with integral door pull, recessed for latch lifter and locking devices; non-protruding latch lifter; and automatic, pre-locking, pry-resistant latch, as follows:
  1. Provide minimum three-point latching for each door more than 42 inches high; minimum two-point latching for each door 42 inches high or less.
    - a. Provide strike and eye for padlock.
  2. Housing shall be bolted to door with a minimum of 2 tamper proof fasteners. Tabs shall not be accepted or approved.

## 2.4 LOCKS

- A. Fabricate all lockers to receive the following locking devices, installed on lockers using security-type fasteners:
  1. Provide hasps for Owner-provided padlocks.

## 2.5 LOCKER ACCESSORIES

- A. Interior Equipment: Furnish each locker with the following items, unless otherwise indicated:
  1. Hooks: Manufacturer's standard zinc-plated, ball-pointed steel. Provide one double-prong ceiling hook, and not fewer than two single-prong wall hooks for single-, and double-tier units. Attach hooks with at least two fasteners.
- B. Number Plates: Manufacturer's standard etched, embossed, or stamped, aluminum number plates with numerals at least 3/8 inch high. Number lockers in sequence indicated. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
- C. Continuously Sloping Tops: Manufacturer's standard, fabricated from minimum 20 gauge (0.0359 inch) thick steel sheet, for installation over lockers with separate flat tops. Fabricate tops in lengths as long as practicable, without visible fasteners at splice locations, finished to match lockers. Provide fasteners, filler plates, supports, and closures, as follows:
  1. Closures: Hipped end type.
- D. Recess Trim: Manufacturer's standard; fabricated from minimum 18 gauge (0.0478-inch) thick steel sheet, minimum 2-1/2-inch face width, and finished to match lockers. Fabricate trim in lengths as long as practicable.

- E. Filler Panels: Manufacturer's standard; fabricated from minimum 18 gauge (0.0478-inch) thick steel sheet in an unequal leg angle shape, and finished to match lockers. Provide slip joint filler angle formed to receive filler panel.
- F. Boxed End Panels: Manufacturer's standard; fabricated from minimum 16 gauge (0.0598-inch) thick steel sheet, with 1-inch- wide edge dimension, finished to match lockers, and designed for concealing exposed ends of non-recessed lockers.

## **2.6 FABRICATION**

- A. Unit Principle: Fabricate each locker with an individual door and frame, individual top, bottom, back, and shelves, and common intermediate uprights separating compartments.
- B. Knocked-Down Construction: Fabricate lockers for nominal assembly at Project site.
- C. Fabricate lockers square, rigid, and without warp, with metal faces flat and free of dents or distortion. Make exposed metal edges free of sharp edges and burrs, and safe to touch. Weld frame members together to form a rigid, one-piece assembly.
  - 1. Form locker-body panels, doors, shelves and accessories from one-piece steel sheet, unless otherwise indicated.

## **2.7 FINISHES, GENERAL**

- A. Finish all steel surfaces and accessories, except pre-finished stainless-steel and chrome-plated surfaces.
- B. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## **2.8 GALVANIZED STEEL SHEET FINISHES**

- A. Surface Preparation: Clean surfaces with non-petroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
  - 1. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing welds in steel, complying with SSPC-Paint 20.

- B. Baked-Enamel Finish: Immediately after cleaning and pre-treating, apply manufacturer's standard baked-enamel finish consisting of a thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 1.4 mils on doors, frames, and legs, and 1.1 mils elsewhere.
  - 1. Colors and Gloss: See Finish Schedule. (If not in Finish Schedule, as selected by Architect from manufacturer's full range of colors.)

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine all bases for suitable conditions where metal lockers are to be installed.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. Install metal lockers and accessories level, plumb, rigid, and flush according to manufacturer's written instructions.
- B. Assemble knocked-down lockers with standard fasteners, with no exposed fasteners on door faces and face frames.
- C. Anchor lockers to floors and walls at intervals recommended by manufacturer, but not more than 36 inches o.c. Install anchors through backup reinforcing plates where necessary to avoid metal distortion, using concealed fasteners.
- D. Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
  - 1. Attach recess trim to recessed lockers with concealed clips.
  - 2. Attach sloping top units to lockers, with closures at exposed ends.
- E. Attach boxed end panels with concealed fasteners to conceal exposed ends of non-recessed lockers.

### **3.3 ADJUSTING, CLEANING, AND PROTECTION**

- A. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.
- B. Clean interior and exposed exterior surfaces and polish stainless-steel and nonferrous-metal surfaces.
- C. Protect lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit locker use during construction.
- D. Touch up marred finishes, or replace locker units that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

**END OF SECTION**



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## SECTION 10 7500

### FLAGPOLES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes:
  - 1. Ground-set, fixed, cone tapered aluminum flagpoles with integral lighting.

##### 1.3 SUBMITTALS

- A. Product Data: Provide product data and installation instructions for each type of flagpole required.
- B. Shop Drawings: Provide shop drawings of flagpoles and bases, showing general layout, jointing, grounding method, and anchoring and supporting systems.
  - 1. Include details of foundation system for ground-set poles.
- C. Samples: Provide samples of each finished metal for flagpoles and accessories as requested by Architect.

##### 1.4 QUALITY ASSURANCE

- A. Manufacturing Standards: Provide each flagpole as a complete unit produced by a single manufacturer, including fittings, accessories, bases, and anchorage devices.
- B. Design Criteria: Provide flagpoles and installations constructed to withstand a 90-mph wind velocity minimum when flying flag of appropriate size. Use heavy pipe sizes if required for flagpole type and height shown.
- C. Pole Construction: Construct pole and ship to site in one piece if possible. If more than one piece is necessary, provide snug-fitting, precision joints with self-aligning, internal

##### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. General: Spiral wrap flagpoles with heavy Kraft paper or other weather-tight wrapping and prepare for shipment in hard fiber tube or other protective container.
- B. Delivery Procedure: Deliver flagpoles and accessories completely identified for installation procedure. Handle and store flagpoles to prevent damage or soiling.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:
1. American Flagpole Div. of Kearney-National, Inc.
  2. Concord Industries, Inc.: Executive Model
  3. EMC Division, Eder Manufacturing Corp.
  4. Liberty Flagpoles

### **2.2 FLAGPOLE TYPES**

- A. Aluminum Flagpoles: Fabricate from seamless extruded tubing complying with ASTM B 241, alloy 6063-T6, having a minimum wall thickness of 5/32 inch, tensile strength not less than 30,000 psi, and a yield point of 25,000 psi. Heat-treat and age-harden after fabrication.
1. Type: Provide cone-tapered aluminum flagpoles.
  2. Height and Number: Provide one (1) flagpole, 30 feet high. Height is measured from above grade.
  3. Internal Halyards.
  4. Flagpole Lighting: Liberty Commercial II Grade solar flagpole light, 12 LEDs in sealed metal housing, providing 12 hours of continuous brightness at 1000+ lumens. 6V, 15 W solar panel and 3.7V 12,000mAh battery.

### **2.3 FLAGPOLE MOUNTING**

- A. Base: Provide manufacturer's standard base system for the type of flagpole installation required.
- B. Foundation Tube: For ground-set flagpoles, provide 16-gage minimum galvanized corrugated steel tube, or 12-gage rolled steel tube, sized to suit flagpole and installation. Furnish complete with welded steel bottom base and support plate, lightning ground spike, and steel centering wedges, all welded construction. Provide loose hardwood wedges at top for plumbing pole after erection. Galvanize steel parts after assembly, including foundation tube.
1. Provide manufacturer's standard flash collar, finished to match flagpole.

### **2.4 SHAFT FINISH**

- A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
- B. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44.
1. Color: Dark bronze.
  2. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## **2.5 FITTINGS**

- A. Finial Ball: Manufacturer's standard flush-seam ball, size as indicated or, if not indicated, to match pole butt diameter.
  - 1. 14-gauge spun aluminum finished to match pole shaft.
- B. Truck: Ball-bearing, non-fouling, revolving, double-track assembly of cast metal finished to match pole shaft.
- C. Internal Halyard, Cam Cleat System: 5/16-inch- diameter, braided polypropylene halyard; cam cleat; and concealed revolving truck assembly with plastic-coated counterweight and sling. Provide flush access door secured with cylinder lock. Finish truck assembly to match flagpole
- D. Halyard Flag Snaps: Provide two swivel snaps per halyard, as follows:
  - 1. Chromium-plated bronze.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION FOR GROUND-SET POLES**

- A. Excavation: Excavate for foundation concrete to neat clean lines in undisturbed soil. Provide forms where required due to unstable soil conditions. Remove wood, loose soil, rubbish, and other foreign matter from excavation; and moisten earth before placing concrete. Back fill open excavation after concreting with original excavated material.
- B. Concrete: Provide concrete composed of Portland cement, coarse and fine aggregate, and water mixed in proportions to attain 28-day compressive strength of not less than 3000 psi, complying with ASTM C 94.
- C. Place concrete immediately after mixing. Compact concrete in place by use of vibrators. Moist-cure exposed concrete for not less than 7 days, or use a non-staining curing compound in cold weather.
- D. Concrete Finish: Finish trowel exposed concrete surfaces to smooth, dense surface. Provide positive slope for water runoff to base perimeter.

### **3.2 FLAGPOLE INSTALLATION**

- A. General: Prepare and install flagpoles where shown and in compliance with accepted shop drawings and manufacturer's instructions.
  - 1. Provide positive lightning ground for each flagpole installation.
  - 2. Paint below-grade portions of ground-set flagpole with heavy coat of bituminous paint.
- B. Foundation-Tube Installation: Install flagpole in foundation tube, seated on bottom plate between steel centering wedges. Plumb flagpole and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch layer of elastomeric sealant and cover with flashing collar.

**END OF SECTION**

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## **DIVISION 11 - EQUIPMENT**

|                    |                                   |
|--------------------|-----------------------------------|
| Section 11 1319    | Stationary Loading Dock Equipment |
| Section 11 3013    | Residential Appliances            |
| Section 11 3300    | Retractable Stairs                |
| Section 11 4000    | Food Service Equipment            |
| Section 11 5223    | Audio-Visual Equipment Supports   |
| Section 11 5353.13 | Safety Storage Cabinets           |
| Section 11 5713    | Hoses and Hose Reels              |
| Section 11 6113    | Platform Curtains                 |
| Section 11 6623.13 | Gymnasium Basketball Equipment    |
| Section 11 6813    | Playground Equipment              |
| Section 11 6816    | Playground Structures             |
| Section 11 6823.13 | Exterior Basketball Equipment     |
| Section 11 7313    | Adult Changing Table              |
| Section 11 7913    | Therapy Swings                    |

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## SECTION 11 1319

### STATIONARY LOADING DOCK EQUIPMENT

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. Section Includes:
  - 1. Recessed dock levelers.
  - 2. Vehicle restraints.
- B. Related Requirements:
  - 1. Section 05 5000 "Metal Fabrications" for curb angles at edges of recessed pits and loading dock platform edge channels.
  - 2. Section 08 3613 "Sectional Overhead Doors" for overhead doors serving dock levelers.

##### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Inspect and discuss electrical roughing-in, equipment bases, and other preparatory work specified elsewhere.
  - 2. Review sequence of operation for each type of loading dock equipment.
  - 3. Review coordination of interlocked equipment specified in this Section and elsewhere.
  - 4. Review required testing, inspecting, and certifying procedures.

##### 1.4 DEFINITIONS

- A. Operating Range: Maximum amount of travel above and below the loading dock level.
- B. Working Range: Recommended amount of travel above and below the loading dock level for which loading and unloading operations can take place.

##### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for stationary loading dock equipment.
  - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.



- B. Shop Drawings: For stationary loading dock equipment.
  - 1. Include plans, elevations, sections, details, and attachments to other work.
  - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of anchors and field connection.

## **1.6 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For Installer.
- B. Welding certificates.
- C. Product Test Reports: For each dock leveler, for tests performed by manufacturer and witnessed by a qualified testing agency.
  - 1. Indicate compliance of dock levelers with requirements in MH 14.1-1987 for determining rated capacity, which is based on comprehensive testing within last two years of current products.
  - 2. Submittal Form: According to MH 14.1-1987.
- D. Sample Warranty: For manufacturer's special warranty.

## **1.7 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For stationary loading dock equipment to include in operation and maintenance manuals.

## **1.8 QUALITY ASSURANCE**

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
  - 1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  - 2. AWS D1.3, "Structural Welding Code - Sheet Steel."

## **1.9 FIELD CONDITIONS**

- A. Field Measurements: Verify actual dimensions of construction contiguous with stationary loading dock equipment, including recessed pit dimensions, slopes of driveways and heights of loading docks, by field measurements before fabrication.

## **1.10 WARRANTY**

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace dock levelers that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including cracked or broken structural support members, load-bearing welds, and front and rear hinges.
    - b. Faulty operation of operators, control system, or hardware.
    - c. Deck plate failures including cracked plate or permanent deformation in excess of 1/4 inch between deck supports.
    - d. Hydraulic system failures including failure of hydraulic seals and cylinders.

2. Warranty Period for Structural Assembly: 10 years from date of Substantial Completion.
3. Warranty Period for Hydraulic System: Five years from date of Substantial Completion.
4. Warranty shall be for unlimited usage of leveler for the specified rated capacity over the term of the warranty.

## **PART 2 - PRODUCTS**

### **2.1 RECESSED DOCK LEVELERS**

- A. General: Recessed, hinged-lip-type, dock levelers designed for permanent installation in concrete pits preformed in the edge of loading platform; of type, function, operation, capacity, size, and construction indicated; and complete with controls, safety devices, and accessories required.
- B. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other available manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
  1. Manufacturer: Serco.
  2. Product: HL Hydraulic Dock Leveler.
- C. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers with products which may be incorporated into the Work include, but are not limited to, the following:
  1. Blue Giant USA Corporation; [www.bluegiant.com](http://www.bluegiant.com)
  2. DLM, Inc.; [www.dlminc.net](http://www.dlminc.net).
  3. Kelley Dock Systems, Entrematic Group AB; [www.kellyentrematic.com](http://www.kellyentrematic.com).
  4. Rite-Hite Corporation; [www.ritehite.com](http://www.ritehite.com).
  5. Serco, 4Front Engineered Solutions, Inc.; [www.sercocompany.com](http://www.sercocompany.com)
- D. Standard: Comply with ANSI/MH 14.1
- E. Rated Capacity: 45,000 lbs.
- F. Electrical Requirements: 208 V, 3 phase
- G. Pit Dimensions: 8 feet x 7 feet
- H. Platform: Not less than 1/4-inch- thick, nonskid steel plate.
  1. Platform Size: As indicated on Drawings.
  2. Frame: Manufacturer's standard.
  3. Toe Guards: Equip open sides of dock leveler over range indicated with metal toe guards.
    - a. Toe-Guard Range: Entire upper operating range.
- I. Hinged Lip: Not less than 5/8-inch- thick, nonskid steel plate.
  1. Hinge: Full-width, piano-type hinge with heavy-wall hinge tube and grease fittings, with gussets on lip and ramp for support.
  2. Safety Barrier Lip: Designed to protect material-handling equipment from an accidental fall from loading platform edge of the dock leveler when the leveler is not in use.

- J. Function: Dock levelers shall compensate for differences in height between truck bed and loading platform.
1. Vertical Travel: Operating range above platform level of sufficient height to enable lip to extend and clear truck bed before contact with the following minimum working range:
    - a. Above Adjoining Platform: 12 inches.
    - b. Below Adjoining Platform: 12 inches.
  2. Automatic Vertical Compensation: Floating travel of ramp with lip extended and resting on truck bed shall compensate automatically for upward or downward movement of truck bed during loading and unloading.
  3. Automatic Lateral Compensation: Tilting of ramp with lip extended and resting on truck bed shall compensate automatically for canted truck beds of up to 4 inches over width of ramp.
  4. Lip Operation: Manufacturer's standard mechanism, which automatically extends and supports hinged lip on ramp edge with lip resting on truck bed over dock leveler's working range, allows lip to yield under impact of incoming truck and automatically retracts lip when truck departs.
    - a. Length of Lip Extension: 20 inches.
  5. Interlock: Leveler does not operate while overhead door is in closed position.
- K. Construction: Fabricate dock-leveler frame, platform supports, and lip supports from structural- or formed-steel shapes. Weld platform and hinged lip to supports. Fabricate entire assembly to withstand deformation during both operating and stored phases of service. Chamfer lip edge to minimize obstructing wheels of material-handling vehicles.
1. Cross-Traffic Support: Manufacturer's standard method of supporting ramp at platform level in stored position with lip retracted. Provide a means to release supports to allow ramp to descend below platform level.
  2. Maintenance Strut: Integral strut to positively support ramp in up position during maintenance of dock leveler.
- L. Materials:
1. Steel Plates, Shapes, and Bars: ASTM 36/A 36M.
  2. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from steel plate complying with ASTM A 572/A 572M, Grade 55 (380).
  3. Steel Tubing: ASTM A 500/A 500M, cold formed.
  4. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- M. Dock-Leveler Finish: Manufacturer's standard finish.
1. Toe Guards: Paint toe guards to comply with ANSI Z535.1.
- N. Accessories:
1. Curb Angles: 3-by-3-by-1/4-inch galvanized-steel curb angles for edge of recessed leveler pit, with 1/2-inch- diameter by 6-inch- long concrete anchors welded to angle at 6 inches o.c.
  2. Night Locks: Manufacturer's standard means to prevent extending lip and lowering ramp when overhead doors are locked.
  3. Side and rear weatherseals.
  4. Abrasive skid-resistant or smooth surface, as selected by Architect.
  5. Bumpers: VB 620-11F-SF

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical systems for loading dock equipment to verify actual locations of connections before equipment installation.
- C. Examine walls and floors of pits for suitable conditions where recessed loading dock equipment is to be installed. Pits shall be plumb and square and properly sloped for drainage from back to front of loading dock.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Coordinate size and location of loading dock equipment indicated to be attached to or recessed into concrete or masonry, and furnish anchoring devices with templates, diagrams, and instructions for their installation.
- B. Set curb angles in concrete edges of dock-leveler recessed pits with tops flush with loading platform. Fit exposed connections together to form hairline joints.
- C. Place self-forming pan system for recessed dock levelers in proper relation to loading platform before pouring concrete.
- D. Clean recessed pits of debris.

### **3.3 INSTALLATION**

- A. General: Install loading dock equipment as required for a complete installation.
  - 1. Rough-in electrical connections.
- B. Recessed Dock Levelers: Attach dock levelers securely to loading dock platform, flush with adjacent loading dock surfaces and square to recessed pit.
- C. Restraints: Install in accordance with manufacturer's written instructions.

### **3.4 ADJUSTING**

- A. Adjust loading dock equipment to function smoothly and safely, and lubricate as recommended by manufacturer.
- B. Test dock levelers for vertical travel within operating range indicated.
- C. After completing installation of exposed, factory-finished loading dock equipment, inspect exposed finishes and repair damaged finishes.

### **3.5 MAINTENANCE SERVICE**

- A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of loading dock equipment Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper loading dock equipment operation at rated speed and capacity. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

### **3.6 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain loading dock equipment.

**END OF SECTION**

## SECTION 11 3013

### RESIDENTIAL APPLIANCES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. **This Section includes** the following:
  - 1. Microwave ovens.
  - 2. Refrigerator/freezer.
  - 3. Clothes washer and dryer.
  - 4. Ice maker.
- B. Related Sections include the following:
  - 1. Section 12 3200 "Manufactured Cabinets and Casework" for standard cabinets and countertops that receive residential appliances.
  - 2. Section 22 1116 "Domestic Water Piping" for water distribution piping connections to residential appliances.
  - 3. Section 22 1316 "Sanitary Waste and Vent Piping" for drainage and vent piping connections to residential appliances.
  - 4. Section 22 4000 "Plumbing Fixtures" for kitchen sinks, waste disposers, and instant hot-water dispensers.
  - 5. Section 26 0120 "Conductors and Cables" for services and connections to residential appliances.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include operating characteristics, dimensions of individual appliances, and finishes for each appliance.
- B. Appliance Schedule: For appliances. Use same designations indicated on Drawings.
- C. Maintenance Data: For each product to include in maintenance manuals.
- D. Warranties: Special warranties specified in this Section.

##### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain residential appliances through one source.
  - 1. Provide products from same manufacturer for each type of appliance required.
- B. Product Options: Information on Drawings and in Specifications establishes requirements for product's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

- C. Regulatory Requirements: Comply with provisions of the following product certifications:
  - 1. NFPA: Provide electrical appliances listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
  - 2. UL and NEMA: Provide electrical components required as part of residential appliances that are listed and labeled by UL and that comply with applicable NEMA standards.
  - 3. ANSI: Provide gas-burning appliances that comply with ANSI Z21 Series standards.
  - 4. NAECA: Provide residential appliances that comply with NAECA standards.
  
- D. AHAM Standards: Provide appliances that comply with the following AHAM standards:
  - 1. Dishwashers: AHAM DW-DW1.
  - 2. Electric Ranges: AHAM ER-1.
  - 3. Clothes Dryers: AHAM HLD-1.
  - 4. Household Refrigerators/Household Freezers: AHAM HRF-1.
  
- E. Energy Ratings: Provide residential appliances that carry labels indicating energy-cost analysis (estimated annual operating costs) and efficiency information as required by the FTC Appliance Labeling Rule.
  - 1. Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.

## 1.5 WARRANTY

- A. Special Warranties: Manufacturer's standard form in which manufacturer of each appliance specified agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.
  - 1. Microwave Oven: Five-year limited warranty for defects in the magnetron tube.
  - 2. Refrigerator/Freezer: Five-year limited warranty for in-home service on the sealed refrigeration system.
  - 3. Dishwasher: 10-year warranty for in-home service against deterioration of tub and door liner.
  - 4. Clothes Washer: 10-year limited warranty for the inner wash basket and outer tub, and five-year limited warranty for the balance suspension system and drive transmission.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers with products that may be incorporated into the Work include, but are not limited to:
    - a. General Electric Company.
    - b. Hotpoint, a General Electric Company brand.
    - c. KitchenAid, a Whirlpool Corporation brand.
    - d. Maytag, a Whirlpool Corporation brand.
    - e. **Whirlpool** Corporation
    - f. Sanyo North America Corporation, a member of the Panasonic Group.
    - g. Manitowoc Ice, a Manitowoc Food Service brand.
    - h. Scotsman

2. Basis-of-Design: The design for each residential appliance is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

## 2.2 COOKING APPLIANCES

- A. Microwave Oven:
1. Basis of Design: General Electric Company Model No, JEB1860SMSS.
  2. Oven: Standard features include the following:
    - a. Oven Features: Digital control panel with timer display, turntable,
    - b. Mounting: Countertop.
    - c. Electrical Power: 1100 W.
    - d. Oven Door: Counter-balanced, removable, stainless steel finish with observation window.
    - e. Capacity: 1.8 cu ft.
    - f. Size: 13-3/4 inches high x 19-1/4 inches deep x 23-7/8 inches wide
    - g. Color: Stainless Steel.

## 2.3 REFRIGERATION APPLIANCES

- A. Refrigerator/Freezer:
1. Basis of Design: Whirlpool Company Model No. GB2FHDXWS.
  2. Type: Freestanding, Bottom Freezer.
  3. Storage Capacity:
    - a. Fresh Food Compartment Volume: 15.6 cu. ft.
    - b. Freezer Volume: 6.3 cu. Ft.
  4. Refrigerator Features:
    - a. Compartment Storage: 2 humidity controlled crispers, dairy compartment, snack pan, 4 clear door bins, 1 fixed gallon door bin.
    - b. Digital temperature control
  5. Freezer Features:
    - a. Automatic ice maker.
    - b. 2 slide out freezer baskets
  6. Energy Consumption: 488 kWh/year. Energy Star Qualified.
  7. Front Panel: Stainless Steel doors with painted metal cabinet.
  8. Appliance Color: Stainless Steel.
- B. Under Counter Refrigerator:
1. Basis of Design: Sanyo Company Model No. SR-4912M.
  2. Type: Under counter
  3. Storage Capacity:
    - a. Fresh Food Compartment Volume: 4.9 cu. ft.
  4. Refrigerator Features:
    - a. Compartment Storage: Two glass shelves and glass crisper lid. Gallon door storage.
    - b. Adjustable dial temperature control
  5. Energy Consumption: 316 kWh/year. Energy Star Qualified.
  6. Front Panel: Fingerprint - resistant coated, platinum metallic door.
  7. Appliance Color: Platinum Metallic/Black



## 2.4 CLEANING APPLIANCES

- A. Dishwasher:
1. Basis of Design: Whirlpool Company, Model No. WSF310PAAS.
  2. Type: Under the counter; 24 inches wide
  3. Tub: Super capacity; plastic.
  4. Rack System: PVC coated sliding dish racks, with removable silverware basket with cover.
  5. Operation: 4 automatic wash cycles, 5 level wash, high temperature scour option, with temperature and soil sensors. Hard food disposer with self cleaning filter
  6. Controls: Electronic, delay wash option, electronic child lockout function.
  7. Energy Performance: Energy Star; CEE Tier 1.
  8. Appliance Color: Stainless Steel.
- B. Clothes Washer
1. Basis of Design: Whirlpool Company, Model no. WFW96HEAU.
  2. Type: Freestanding, Front loading.
  3. Washer: Ultra Capacity (4.3 cubic feet).
  4. Controls:
    - a. Wash Cycles: Eleven pre-set wash cycles
    - b. Wash Temperatures: Three settings.
    - c. Delay wash option
    - d. Extra rinse option
    - e. Automatic water level control
    - f. Child Lockout
  5. Color: White.
  6. Standard features include the following:
    - a. Door window.
    - b. Innovative suspension system
    - c. Stainless Steel Tub
    - d. Quiet Wash
  7. Energy Performance: Energy Star qualified.
- C. Clothes Dryer
1. Basis of Design: Whirlpool Company, Model no. WED96HEAC.
  2. Type: Free standing, front loading,
  3. Drum Capacity: 7.4 cubic feet.
  4. Number of Cycles: 10 automatic cycles, 3 timed cycles, 5 temperature selections
  5. Fuel Type: Electric.
  6. Power Supply: 120/240 V
  7. Standard features include the following:
    - a. 4-way venting
    - b. Interior Drum light
    - c. Electronic controls
    - d. Door window
    - e. Quiet Dry Noise Reduction

- D. Stacked Washer/Dryer (long vent type)
  - 1. Basis of Design: Whirlpool Company, Model No. WETLV27HW
  - 2. Type: Freestanding, stacked, front loading dryer atop top loading washer.
  - 3. Capacities
    - a. Dryer: 5.9 cubic feet.
    - b. Washer: 3/5 cubic feet.
  - 4. Fuel type: Electric; 30A, 240V
  - 5. Wash Cycles: 9
  - 6. Dryer Cycles: 4.
  - 7. Dimensions: 75-1/2 inches H x 27-1/2 inches W x 32-7/16 inch D.
  - 8. Color: White.

## 2.5 ICE MAKER

- A. Basis of Design: Scotsman: Meridian HID 525A-1 with cabinet stand.
  - 1. Type: Air cooled ice and water dispenser.
  - 2. Storage Capacity: 25 lbs.; production: 500 lbs/24 hours.
  - 3. Dispenses nugget ice.
  - 4. Touch-free operation
  - 5. Dimensions: 21-1/4 inches W x 24-3/8 inches D x 67 inches H; adjustable legs on cabinet stand.
  - 6. Accessories: #HST21B-A Stand, #SSM1-P Filter and (3) Extra Replacement Cartridges.
  - 7. Appliance Color: Stainless Steel.

## 2.6 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Color-Coated: Provide appliances with manufacturer's standard finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, color, gloss, and minimum dry film thickness for painted finishes for uniform, directionally textured finish.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before equipment installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written instructions.

- B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.
- C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- D. Provide, with appliances, hoses, electrical cords, ducts, vents, drains, grounds, etc. necessary for fully functional installations, including piping for ice makers in refrigerator freezers.
- E. Utilities: Refer to Divisions 22 and 26 for plumbing and electrical requirements.

### **3.3 CLEANING AND PROTECTION**

- A. Test each item of residential appliances to verify proper operation. Make necessary adjustments.
- B. Verify that accessories required have been furnished and installed.
- C. Remove packing material from residential appliances and leave units in clean condition, ready for operation.

### **3.4 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain residential appliances. Refer to Division 1 Section "Closeout Procedures."

**END OF SECTION**

**SECTION 11 3300**  
**RETRACTABLE STAIRS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section includes:
  - 1. Manual disappearing stairways.
- B. Related Sections:
  - 1. Section 07 7200 "Roof Accessories" for roof hatch associated with retractable stair.

**1.3 REFERENCES**

- A. ANSI A14.9: Safety Requirements for Ceiling Mounted Disappearing Climbing Systems.

**1.4 SUBMITTALS**

- A. Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- B. Shop Drawings for Stairs:
  - 1. Plan and section of stair installation.
  - 2. Indicate rough opening dimensions for ceiling and roof openings.
  - 3. Coordination with roof hatch opening and controls.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Store stairway until installation inside under cover in manufacturer's unopened packaging. If stored outside, under a tarp or suitable cover.

**1.6 WARRANTY**

- A. Limited Warranty: One year against defective material and workmanship, covering parts only. Defective parts, as deemed by the manufacturer, will be replaced at no charge, freight excluded, upon inspection at manufacturer's plant.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
1. Manufacture: Precision Ladders, LLC.
  2. Product: Super Simplex Disappearing Stairway.

### **2.2 MANUAL DISAPPEARING STAIRWAY.**

- A. Performance Standard: Unit shall comply with ANSI A14.9, Commercial Type, for rough openings between 25-1/2 inches to 39 inches. Stairway capacity shall be rated at 500 lbs.
- B. Accessories:
1. Steel pole to aid opening and closing stairways.
  2. Equip with two (2) fold assists to aid in folding and unfolding of sections.
- C. Components:
1. Ceiling Opening: 30 inches x 104 inches.
  2. Stairway Stringer: 6005-T5 Extruded aluminum channel 5 x 1 x 1/8 inch; tri-fold design; steel blade type hinges; adjustable feet with plastic Mar-guard. Pitch shall be 63°.
  3. Stairway Tread: 6005-T5 extruded aluminum channel 5 3/16 inches by 1 1/4 inches by 1/8 inch. Depth is 5 3/16 inches. Deeply serrated top surface. Riser Height: 9-1/2 inches. Clear Tread Width for Standard Width: 19-1/2 inches.
  4. Railing: Aluminum bar handrail riveted to stringers, upper section only.
  5. Frame: 1/8 inch steel, 63° (with built-in steps) on the hinge end, 90° on the other end, custom depth to fill distance from 13- 6" to roof above.
  6. Door Panel
    - a. Standard (non-fire rated) door: Constructed of 1/8 inch aluminum sheet attached to stairway frame with a steel piano hinge. Door overlaps bottom flange of frame. Eye bolt accommodates pole for opening and closing door.
  7. Hardware:
    - a. Steel blade type hinge connecting stringer sections. Zinc plated and chromate sealed.
    - b. Steel operating arms, both sides. Zinc plated and chromate sealed.
    - c. Double acting steel springs and cable, both sides.
    - d. Rivets rated at 1100 lb shear strength each.
    - e. Steel section alignment clips at stringer section joints.
    - f. Molded rubber guards at corners of aluminum door panel.
  8. Finishes: Mill finish on aluminum stairway components. Prime coat on frame.

### **2.3 FABRICATION**

- A. Completely fabricate ladder ready for installation before shipment to the site.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Do not begin installation until rough opening and structural support have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Examine materials upon arrival at site. Notify the carrier and manufacturer of any damage.

### **3.2 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Coordinate retractable ladder with roof opening and roof hatch.

### **3.3 PROTECTION**

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

**END OF SECTION**

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## SECTION 11 5353.13

### SAFETY STORAGE CABINETS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes storage cabinets for flammable materials.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of accessory specified, with installation instructions for each unit, built-in or connected to other construction. Include methods of installation for each type of substrate.
- B. Shop Drawings: Showing installation details of accessories permanently affixed to instruction, including full-scale installation details of special conditions.
- C. Samples for initial selection purposes consisting of manufacturer's standard size samples showing full range of colors, textures, and patterns available for each type of accessory required.

##### 1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm (material producer) with not less than 3 years of production experience, whose published literature clearly indicates general compliance of products with requirements of this section.
- B. Single Source Responsibility: Provide material produced by a single manufacturer for each accessory type.

##### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, and lot number. Store materials in original undamaged packages and containers, inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity; laid flat, blocked off ground to prevent sagging and warping.
- B. Comply with instructions and recommendations of manufacturer for special delivery, storage, and handling requirements.



## **1.6 SEQUENCE AND SCHEDULING**

- A. Sequence accessory installation with other work to minimize possibility of damage and soiling during remainder of construction period.

## **1.7 MAINTENANCE**

- A. Maintenance Instructions: Submit manufacturer's printed instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated use conditions. Include precautions against materials and method which may be detrimental to finishes and performance.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Sheet Steel: Cold rolled, commercial quality, ASTM A 366, minimum 20 gauge unless otherwise indicated. Surface preparation and metal pretreatment as required for applied finish.
- B. Painted Finish: Baked acrylic enamel coating.
- C. Fasteners: Screws, bolts or other exposed devices of same material as accessory unit, or of galvanized steel where concealed. Equip items with theft-proof fasteners where accessible to tampering.

### **2.2 FABRICATION, GENERAL**

- A. Provide accessory items, permanently installed, equipped with functions as specified. Fabricate units with tight seams and joints, exposed metal edges rolled. Manufacturer or product identification on exposed surfaces is unacceptable. Provide products with smooth welds, consistent finish with no evidence of wrinkling, chipping, uneven coloration, dents, or other imperfections.

### **2.3 SAFETY CABINETS**

- A. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers with products which may be incorporated into the Work include, but are not limited to, the following:
  - 1. Manufacturer: JustRite Manufacturing.
  - 2. Product: Horizontal Flammable Storage Cabinets: Sure-Grip EX 893300.
- B. Safety Storage Cabinets: Fully compliant with NFPA Code 30, prevailing OSHA standards and be FM Approved.

- C. Flammable Storage Cabinets: 18 gauge welded steel with 1.5-inch insulating air space and manual-closing and latching doors
  - 1. Size: 36 inches W x 24 inches D x 35 inches H.
  - 2. Adjustable shelves: One (1) galvanized designed to direct spills to a sump.
  - 3. Finish: Chemical resistant powder coat paint.
  - 4. Capacity: 17 gallons.
  - 5. Color: Yellow.
  - 6. Provide two cabinets, stacked atop one another.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Verify that materials are those specified before installing.
- B. Install accessories after other finishing operations, including painting, have been completed.
- C. Permanently Placed Equipment and Components: Rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated on Shop Drawings; in proper relation to adjacent construction; and aligned with room layout.
- D. Anchoring to In-Place Construction: Use anchors and fasteners where necessary for securing built-in and permanently placed equipment and components to structural support and for properly transferring load to in-place construction.
- E. Adjust accessory items for proper operation. Clean and polish exposed surfaces, using materials and methods recommended by the manufacturer.

### **3.2 PROTECTION**

- A. Protect accessories against damage during remainder of construction period, complying with manufacturer's directions.

**END OF SECTION**

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## SECTION 11 5713

### HOSES AND HOSE REELS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This section includes Hose and hose reels.

##### 1.3 SUBMITTALS

- A. Product data for each type of accessory specified, with installation instructions for each unit built-in or connected to other construction. Include methods of installation for each type of substrate.
- B. Shop drawings showing installation details of accessories permanently affixed to construction, including full scale installation details of special conditions.
- C. Samples for initial selection purposes consisting of manufacturer's standard size samples showing full range of colors, textures, and patterns available for each type of accessory required.

##### 1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm (material producer) with not less than 3 years of production experience, whose published literature clearly indicates general compliance of products with requirements of this section.
- B. Single Source Responsibility: Provide material produced by a single manufacturer for each accessory type.

##### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, and lot number. Store materials in original undamaged packages and containers, inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity; laid flat, blocked off ground to prevent sagging and warping.
- B. Comply with instructions and recommendations of manufacturer for special delivery, storage, and handling requirements.

##### 1.6 SEQUENCE AND SCHEDULING

- A. Sequence accessory installation with other work to minimize possibility of damage and soiling during remainder of construction period.

## 1.7 MAINTENANCE

- A. Maintenance Instructions: Submit manufacturer's printed instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated use conditions. Include precautions against materials and method which may be detrimental to finishes and performance.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Fasteners: Screws, bolts or other exposed devices of same material as accessory unit, or of galvanized steel where concealed. Equip items with theft-proof fasteners where accessible to tampering.

### 2.2 FABRICATION, GENERAL

- A. Provide accessory items, permanently installed, equipped with functions as specified. Fabricate units with tight seams and joints, exposed metal edges rolled. Manufacturer or product identification on exposed surfaces is unacceptable. Provide products with smooth welds, consistent finish with no evidence of wrinkling, chipping, uneven coloration, dents, or other imperfections.

### 2.3 HOSES AND HOSE REELS

- A. **Basis of Design:** Contract Documents are based on products specified below to establish a standard of quality. Other manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
  - 1. Manufacturer: Eley; [www.eleyhosereels.com](http://www.eleyhosereels.com)
  - 2. Products: Model 1041 hose reel with 150 feet model 1081 garden hose.
- B. **Features:**
  - 1. Reel: Parallel configuration; rust-proof aluminum-alloy metal construction, leak-proof brass swivel; cam-lever brake; crank handle
    - a. Capacity: 150 feet 5/8 inch hose.
    - b. Finish: Powder-coat.
    - c. Warranty: 10 years.
  - 2. Hose: 5/8 inch inside diameter, polyurethane hose with crush-proof, nickel-plated brass fittings; rated to 160 psi and -40 degrees F to 165 degrees F.
    - a. Kink-resistant.
    - b. Color: Tan.
    - c. Warranty: 10 years.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Verify that materials are those specified before installing.
- B. Install accessories after other finishing operations, including painting, have been completed.

- C. Permanently Placed Equipment and Components: Rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated on Shop Drawings; in proper relation to adjacent construction; and aligned with room layout.
- D. Anchoring to In-Place Construction: Use anchors and fasteners where necessary for securing built-in and permanently placed equipment and components to structural support and for properly transferring load to in-place construction.
- E. Adjust accessory items for proper operation. Clean and polish exposed surfaces, using materials and methods recommended by the manufacturer.

### **3.2 PROTECTION**

- A. Protect accessories against damage during remainder of construction period, complying with manufacturer's directions.

**END OF SECTION**

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**SECTION 11 6113**  
**PLATFORM CURTAINS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section includes:
  - 1. Stage curtains and rigging.
  - 2. All necessary items to provide a complete operating stage rigging system, including but not limited to platform curtains, platform curtain tracks and all necessary items for hanging the curtains.
- B. Related Sections include the following:
  - 1. Section 05 5000 "Metal Fabrications" for supplementary metal members supporting stage-curtain systems to structure.

**1.3 DEFINITIONS**

- A. **Overlap:** Track that extends beyond curtain centerline to ensure closure of bi-parting curtain.
- B. **Rigging:** General term for hardware used to move scenery, lights, or curtains on or over the stage.
- C. **Trim:** Adjustment of height or level of curtain or equipment.

**1.4 SUBMITTALS**

- A. **Product Data:** For each type of product indicated.
- B. **Shop Drawings:** Show fabrication and installation details for stage curtains. Include plans, elevations, sections, details, attachments to other work, and the following:
  - 1. Operating clearances.
  - 2. Requirements for supporting curtains, track, and equipment. Verify capacity of each track and rigging component to support loads.
- C. **Samples for Selection:** For each type of stage curtain indicated; include color charts showing the full range of colors, textures, and patterns available, together with a 12-inch- square sample (any color) of each type fabric.
- D. **Qualification Data:** For Installer. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. **Maintenance Data:** For stage curtains and rigging to include in maintenance manuals.



## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual experienced in installing stage curtains and rigging similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Fire-Test-Response Characteristics: Provide stage curtains with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or a testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Flame-Resistance Ratings: NFPA 701.
  - 2. Permanently attach label to each fabric of curtain assembly indicating whether fabric is inherently and permanently flame resistant or treated with flame-retardant chemicals, and whether it will require retreatment after designated time period or cleaning.
- C. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

## 1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify stage-curtain openings and the dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings.

## PART 2 - PRODUCTS

### 2.1 CURTAIN FABRICS

- A. **General:** Provide fabrics inherently and permanently flame resistant or chemically flame resistant by immersion treatment to comply with requirements indicated. Provide fabrics from the same dye lot.

### 2.2 MAIN CURTAIN

- A. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers with products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. J. L. de Ball America, Inc.
  - 2. KM Fabrics, Inc.
  - 3. Rose Brand
  - 4. Valley Forge Fabrics, Inc.
- B. Fabric: 100 percent Polyester IFR Equal to 'Prestige' or 'Diablo'.
- C. Fabric Weight: Fabric weighing not less than 24 oz./ linear yard with pile height not less than 75 mils.
- D. Colors, Textures, and Patterns: As listed in the Color Schedule, or if not listed in the Color Schedule then as selected by Architect from manufacturer's full range.

## 2.3 BACK PANELS

- A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other available manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
1. Manufacturer: Rose Brand; [www.rosebrand.com](http://www.rosebrand.com)
  2. Fabric: 100 percent Cotton Nassau Chevron Repp FR.
    - a. Fabric Weight: Fabric weighing not less than 0.89 pounds / linear yard
- B. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers with products that may be incorporated into the Work include, but are not limited to, the following:
1. Fred Krieger & Co.
  2. Milliken's Stage Curtain Fabric.
  3. Rose Brand.
  4. Valley Forge Fabrics.
- C. Color: Black.

## 2.4 CYCLORAMA-SETTING CURTAIN FABRIC

- A. Woven Cotton Velour: Napped fabric of 100 percent cotton; 54-inch minimum width; and other characteristics as follows:
1. Medium Weight: Fabric weighing not less than 20 oz./linear yard before flame-retardant treatment, with pile height not less than 75 mils.

## 2.5 CURTAIN FABRICATION

- A. General: Affix permanent label, stating compliance with requirements of authorities having jurisdiction, in accessible location on curtain not visible to audience. Provide vertical seams, unless otherwise indicated. Arrange vertical seams so they do not fall on faces of pleats. Do not use fabric cuts less than one-half width.
1. Vertical Hems: Provide vertical hems not less than 2 inches wide, with not less than a 1-inch tuck, and machine-sewn with no selvage material visible from front of curtain. Sew open ends of hems closed.
  2. Leading Edge Turnbacks: At main curtain only, provide turnbacks formed by folding not less than 12 inches of face fabric back, with not less than a 1-inch tuck, and secured by sewing turnbacks vertically.
  3. Top Hems: Reinforce top hems by double-stitching 3-1/2-inch- wide, heavy jute webbing to top edge with not less than 2 inches of face fabric turned under.
  4. Pleats: Provide 50 percent fullness in curtains, exclusive of turnbacks and hems, by sewing additional material into 3-inch double-stitched box pleats spaced at 12 inches o.c. along top hem reinforcement for the main curtain and 8 inches o.c. for the legs and back panels.
  5. Grommets: Brass, No. 3, centered on each box pleat and 1 inch from corner of curtain for S-hooks.
    - a. For black curtains, provide brass or aluminum grommets with black finish.
  6. Bottom Hems: For floor-length curtains, provide hems not less than 6 inches deep with 1-inch weight tape or jack chain or weight at each seam. Sew open ends of hems closed.
  7. Continuity: Traveling Curtains are to be continuous and leg curtains to be in 8'-0" panels.

## 2.6 RIGGING (FOR BOTH TRAVELING CURTAIN AND REAR CURTAIN TRACKS)

- A. Heavy-Duty Track System Manufacturers:
1. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other available manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect
    - a. Manufacturer: H & H Specialties, Inc.
    - b. Product: 201B series, black.
  2. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Automatic Devices Company.
    - b. H & H Specialties, Inc.;
    - c. Tru-Roll, Inc.
- B. Steel-Track Channels: Fabricate of 16 gauge roll-formed galvanized steel sheet, with continuous bottom slot, and with each half of track in one continuous piece, 1 ¾ inch wide and 2 inch high with semi-gloss black powder coat finish.
- C. S-Hooks: Track manufacturer's heavy-duty plated-wire hooks.
- D. Supports, Clamps and Anchors: Sheet steel in manufacturer's standard thicknesses, galvanized after fabrication according to ASTM A 153/A 153M, Class B.
- E. Battens: Battens may be used at contractor's option. Size battens as required to support curtain loads. If battens are used to support curtain tracks, the battens must be located above the lay-in ceiling. Provide support cables from battens to roof or floor joists above and have support cables penetrate the lay-in ceiling.
- F. Support Cable: 1/4-inch- diameter coil proof chain and forged shackles with pin. Quick locks are not acceptable, or use 3/8 inch all-thread bolted to roof or floor joists with 'unistrut' at Contractor's option.
- F. Inserts, Bolts, Rivets, and Fasteners: Manufacturer's standard corrosion-resistant units.

## 2.7 TRAVELING CURTAIN TRACK FABRICATION

- A. General: Provide center-parting tracks for curtains as indicated on Drawings. Provide the following items for the traveling curtain and any other elements as required in order to provide a complete operating curtains.
- B. Heavy-Duty Track System Manufacturers:
1. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other available manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect
    - a. Manufacturer: H & H Specialties, Inc.
    - b. Products:
      - 1) 300 Series if the traveling curtain has a curve.
      - 2) 200 Series if the traveling curtain is straight.
  2. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Automatic Devices Company.
    - b. H & H Specialties, Inc.
    - c. Tru-Roll, Inc.

- C. **Provide** the following items for the traveling curtain and any other elements as required in order to provide a complete and operating travel curtain:
1. **Pulley System:** Equip track with heavy-duty, live-end, double-wheel pulley; heavy-duty, dead-end, single-wheel pulley; and adjustable, heavy-duty floor block; each with not less than 5-inch molded-nylon- or glass-filled-nylon-tired ball-bearing wheels, enclosed in steel housings. Design adjustable floor block to maintain proper tension on operating line. Supply adequate double and single spindles and outside idlers to keep the rope tight around the curve.
  2. **Carriers:** H & H No. 201 Black Single Carriers. Carriers to have 2 polyethylene wheels riveted to black super tough nylon body with shielded ball bearing, heavy-duty hook, swivel and trim chain for curtain attachment. Each carrier to have 1 rubber bumper. Space carriers at 12 inches along the curtain.
  3. **Carrier Accessories and Curtain Attachment:** Equip carriers with neoprene or rubber bumper to reduce noise, and heavy-duty, plated-steel swivel eye and manufacturer's standard trim chain for attaching S-hook. Provide end stops for track.
  4. **Operating Line:** Manufacturer's standard 3/8-inch stretch-resistant operating cord consisting of braided synthetic-fiber jacket over solid, synthetic-fiber, linear, center filaments. Color to be Black.
  5. **Track Lap Clamp:** Metal to match track channel for attaching double-sectioned track at center overlap.
  6. **Curtain Carriers:** For track spaced at 12 inches o.c.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine areas and conditions, with Installer present, for compliance with requirements for supporting members, blocking, installation tolerances, clearances, and other conditions affecting performance of stage-curtain work. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Examine inserts, clips, blocking, or other supports required to be installed by others to support tracks and battens. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION, GENERAL**

- A. Install stage-curtain system according to track manufacturer's and curtain fabricator's written instructions.

### **3.3 TRACK INSTALLATION**

- A. **Track Mounting:** Install tracks by suspending from roof structure above. Attach track according to manufacturer's written instructions. Attach to the top chord of roof or floor trusses or top flange of beam. If battens are used they must be mounted above the lay-in ceiling.
- B. **Spacing:** Do not exceed 6' - 0" supports.
- C. **Lap Distance:** Install track for center-parting curtains with not less than 24-inch overlap of track sections at center, supported by special lap clamps.

**3.4 CURTAIN INSTALLATION**

- A. Track Hung: Secure curtains to track carriers with track manufacturer's special heavy-duty S-hooks.

**END OF SECTION**

## SECTION 11 6623.13

### GYMNASIUM BASKETBALL EQUIPMENT

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following gymnasium equipment:
  - 1. Basketball equipment.
- B. Related Sections include the following:
  - 1. Section 05 1200 "Structural Steel" for structural supports not provided by gymnasium equipment manufacturer for supporting gymnasium equipment to building structure.
  - 2. Division 26 Sections for electrical service and connections for motor operators, controls, limit switches, and other powered devices and for system disconnect switches for motorized gymnasium equipment.

##### 1.3 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Provide basketball backstops capable of withstanding the effects of earthquake motions determined according to the building code in effect for this Project or ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads," whichever is more stringent.

##### 1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, features, and finishes. Include details of anchors, hardware, and fastenings. If applicable, include assembly, disassembly, and storage instructions.
  - 1. Gymnasium Equipment Operators: Include operating instructions.
  - 2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.
- B. Shop Drawings: Show location and extent of fully assembled gymnasium equipment. Show location and extent of disassembled equipment and components and transport and storage accessories. Include elevations, sections, and details not shown in Product Data. Show method of field assembly, connections, installation details, mountings, floor inserts, attachments to other Work, operational clearances, and relationship to adjoining work.
  - 1. Blocking and Reinforcement: Show locations of blocking and reinforcement required for support of gymnasium equipment.
  - 2. Setting Drawings: For cast-in floor insert sleeves for post standards.
  - 3. Design Calculations: Verify capacity of members and connections to support loads and verify loads, point reactions, and locations for attachment of gymnasium equipment to structure with those indicated on Drawings.

4. Gymnasium Equipment Operators: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
  5. Wiring Diagrams: Power, signal, and control wiring.
- C. Coordination Drawings: Court layout plans and elevations drawn to scale and coordinating game lines and markers applied to finished flooring with overhead gymnasium equipment.
  - D. Samples for Selection: For each type of gymnasium equipment indicated.
  - E. Maintenance Data: For gymnasium equipment and gymnasium equipment operator to include in maintenance manuals.

## **1.6 QUALITY ASSURANCE**

- A. Source Limitations: Obtain each type of gymnasium equipment through one source from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

## **1.7 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not install gymnasium equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Verify position and elevation of gymnasium equipment. Verify dimensions by field measurements.

## **1.8 COORDINATION**

- A. Coordinate layout and installation of overhead-supported gymnasium equipment and suspension system components with other construction including structural framing, light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS - BASKETBALL EQUIPMENT**

- A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other available manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
  1. Manufacturer: Spalding Equipment.
  2. Indoor Equipment:
    - a. Interior Forward-folding Backstops: Model 1049.
    - b. Electric Operators: Model 402-742.
    - c. Rectangular Glass Backboards: Model 411-007.
    - d. Goals: Model 411-508.

- B. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. AL, Inc.; ADP Lemco, Inc.
  2. Jaypro Sports, Inc.
  3. Porter Athletic Equipment Co.
  4. Spalding Equipment.

## 2.2 MATERIALS, GENERAL

- A. Steel: Comply with the following:
1. Steel Plates, Shapes, and Bars: ASTM A 36, hot-dip galvanized.
  2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53.
  3. Cold-Formed Steel Tubing: ASTM A 500, Grade A, unless another grade is required by structural loads.
  4. Steel Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513 or steel tubing fabricated from steel complying with ASTM A 569 and complying with the dimensional tolerances in ASTM A 500.
  5. Malleable-Iron Castings: ASTM A 47, grade required by structural loads.
  6. Support Cable: 1/4-inch- diameter, 7x19 galvanized steel aircraft cable with a breaking strength of 7000 lb. Provide fittings complying with cable manufacturer's written recommendations for size, number, and method of installation.
  7. Support Chain: Proof coil chain, complying with ASTM A 413, Grade 30, size and diameter as required by structural loads; plated or painted. Provide fittings complying with chain manufacturer's written recommendations for size, number, and method of installation.
- B. Wood-Based, Structural-Use Panels: Comply with DOC PS 2; for plywood, comply with DOC PS 1.
- C. Equipment Mounting Pads: Wood, transparent finish, size, and quantity as required to mount gymnasium equipment according to manufacturer's written recommendations.
- D. Anchors, Fasteners, Fittings and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed tamperproof, vandal and theft resistant. Provide as required for gymnasium equipment assembly, mounting, and secure attachment.
- E. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107 with minimum strength recommended in writing by gymnasium equipment manufacturer.

## 2.3 BASKETBALL EQUIPMENT

- A. General: Provide equipment complying with requirements in "NCAA/NFHS Basketball Rule Book." Protruding fasteners or exposed bolt heads on front face of backboards are not permitted.



- B. Overhead-Supported - Forward Folding - Backstop: Provide a complete assembly spanning height indicated on Drawings, including primary and secondary superstructure support framing to building structure, pipe and cable bracing, adjustable hangers, clamps, cables, chains, pulleys, fittings, hardware, and fasteners.
1. Framing: Steel pipe, tubing, and shapes. Design framing to minimize vibration during play.
    - a. Center Mast: Welded construction with side sway bracing of pipe.
    - b. Finish: Manufacturer's standard factory-applied, baked powder-coating finish complying with finish manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness; Color: White.
  2. Folding Type: Provide manufacturer's standard assembly for forward-folding, front-braced backstop, with hardware and fittings to permit folding.
  3. Goal Height Adjuster: Adjustable from 8 to 10 feet with gear-drive mechanism, locking in any position within adjustment range, with visible height scale attached to side of framing.
    - a. Operation: Manual with detachable crank handle.
- C. Backstop/Backboard Safety Device: Designed to limit free fall if support cable, support chain, pulleys, fittings, winch, or related components fail; with mechanical automatic reset; 6000-lb load capacity; one per folding backstop.
1. Retractor Device: Manufacturer's standard device designed to retract both support and safety cables, chains, and straps away from play of the basketball when back-stop is in playing position; one per folding backstop
- D. Electric Operator: Provide factory-assembled electric operator for backstop designed for lifting and lowering basketball equipment of type, size, weight, construction, use, and operation frequency indicated. Provide operation system, of size and capacity and with features, characteristics, and accessories suitable for Project conditions, recommended by gymnasium equipment manufacturer; complete with winch or hoist designed to move and hold backstop in any raised or lowered position, electric motor and factory-prewired motor controls with limit controls, remote-control stations, remote-control devices, power disconnect switch, enclosures protecting controls and all operating parts, and accessories required for proper operation. Include wiring from motor controls to motor. Coordinate operator wiring requirements and electrical characteristics with the building electrical system.
1. Comply with NFPA 70.
  2. Control Equipment: Comply with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6 with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.
  3. Winch: Consisting of heavy-duty, fully enclosed worm gear reducer, belt and sprocket drive, cable drum, cable, and fittings.
  4. Electric Motor: UL-approved or -recognized, totally enclosed, insulated, capacitor-start motor, complying with NEMA MG 1, with thermal-overload protection, brake, and permanently lubricated bearings; sized to start and operate size and weight of basketball equipment considering Project's service conditions without exceeding nameplate ratings or considering service factor.
    - a. Service Factor: According to NEMA MG 1, unless otherwise indicated.
    - b. Motor Characteristics: Single phase, minimum 1/2 hp, 115 V, 60 Hz.
  5. Operator Mounting: Wall, on equipment mounting pad.
  6. Remote Controls: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting.
    - a. Control Stations: Manufacturer's standard momentary-contact, three-position, switch-operated control with up, down, and off functions; one switch per each backstop.
    - b. Control Station Enclosure: Provide key-accessed, prime-painted metal enclosure for safeguarding control station. Provide two sets of keys per enclosure.

7. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop basketball equipment at fully retracted and fully lowered positions.
- E. Basketball Backboard: Provide predrilled holes or preset inserts for mounting goals.
1. Description: Rectangular, 72 by 42 inches width by height, fabricated from the following:
    - a. Glass: Not less than 1/2-inch- thick, transparent tempered glass. Provide glass with impact-absorbing, resilient rubber or PVC gasket around perimeter in a fully welded brushed-natural-finish, extruded-aluminum frame, with steel subframe, reinforcement, and bracing and with mounting slots for mounting backboard frame to backstop support framing.
  2. Target Area and Border Markings: Permanently etched in white color, marked in pattern and stripe width according to referenced rules.
  3. Finish: Manufacturer's standard factory-applied, white background.
  4. Rim-Restraining Device: Complying with NCAA and NFHS rules and designed to ensure that basket remains attached if glass backboard breaks.
  5. Goal Mounting Assembly: Compatible with goal, backboard, and support framing, with 5 inches o.c. horizontally and vertically hole pattern for goal attachment.
    - a. Backboard Goal Mounting Assembly: Goal support framing and reinforcement designed to transmit load from goal to backboard frame and to minimize stresses on backboard.
  6. Basketball Goals: Complete with flanges, braces, attachment plate, and evenly spaced loops welded around underside of ring.
    - a. Single-Rim Basket Ring Competition Goal: Materials, dimensions, and fabrication complying with referenced rules.
    - b. Type: Movable, breakaway design with manufacturer's standard breakaway mechanism including positive-lock, preset pressure release, set to release at 230-lb load, and automatic reset. Provide movable ring with rebound characteristics identical to those of fixed, nonmovable ring.
    - c. Mount: Front mount.
    - d. Net Attachment: No-tie loops for attaching net to rim without tying.
    - e. Finish: Manufacturer's standard factory-applied, baked powder-coating finish complying with finish manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness; orange.
  7. Basketball Nets: 12-loop-mesh net, between 15 and 18 inches long, sized to fit rim diameter, and as follows:
    - a. Cord: Made from white cotton.
  8. Safety Pads: Provide safety pads, complying with NCAA and NFHS, designed for backboard thickness indicated and extending continuously along bottom and up sides of backboard and over goal mounting and backboard supports as required by referenced rules.
    - a. Safety Pad Attachment: Bolt-on
    - b. Color: Gray.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for play court layout, alignment of mounting substrates, installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.
1. Verify critical dimensions.

2. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements have been clearly marked for installers. Locate reinforcements and mark locations if not already done.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION, GENERAL**

- A. General: Comply with manufacturer's written installation instructions and competition rules indicated for each type of gymnasium equipment. Complete equipment field assembly, where required.
- B. Unless otherwise indicated, install gymnasium equipment after other finishing operations, including painting, have been completed.
- C. Permanently Placed Gymnasium Equipment and Components: Rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated on Shop Drawings; in proper relation to adjacent construction; and aligned with court layout.
1. Operating Gymnasium Equipment: Verify clearances for movable components of gymnasium equipment throughout entire range of operation and for access to operating components.
- D. Anchoring to In-Place Construction: Use anchors and fasteners where necessary for securing built-in and permanently placed gymnasium equipment to structural support and for properly transferring load to in-place construction.
- E. Connections: Connect automatic operators to building electrical system.

### **3.3 ADJUSTING**

- A. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

### **3.4 CLEANING AND PROTECTION**

- A. After completing gymnasium equipment installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions acceptable to manufacturer and Installer that ensure gymnasium equipment is without damage or deterioration at time of Substantial Completion.
- C. Replace gymnasium equipment and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

### **3.5 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gymnasium equipment. Refer to Division 1 Section "Project Closeout."

**END OF SECTION**

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## SECTION 11 6623.23

### VOLLEYBALL EQUIPMENT

#### GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following gymnasium equipment:
  - 1. Volleyball equipment.
- B. Products furnished, but not installed under this Section, include floor insert sleeves to be cast in concrete subfloors and footings.

##### 1.4 SUBMITTALS

- A. **Product Data:** For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, features, and finishes. Include details of anchors, hardware, and fastenings. If applicable, include assembly, disassembly, and storage instructions.
- B. **Shop Drawings:** Show location and extent of fully assembled gymnasium equipment. Show location and extent of disassembled equipment and components and transport and storage accessories. Include elevations, sections, and details not shown in Product Data. Show method of field assembly, connections, installation details, mountings, floor inserts, attachments to other Work, operational clearances, and relationship to adjoining work.
  - 1. **Setting Drawings:** For cast-in floor insert sleeves for post standards.
- C. **Coordination Drawings:** Court layout plans and elevations drawn to scale and coordinating floor-insert penetrations and game lines and markers applied to finished flooring.
- D. **Samples for Selection:** For each type of gymnasium equipment indicated.

##### 1.6 QUALITY ASSURANCE

- A. **Source Limitations:** Obtain each type of gymnasium equipment through one source from a single manufacturer.

##### 1.7 PROJECT CONDITIONS

- A. **Environmental Limitations:** Do not install gymnasium equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

- B. Field Measurements: Verify position and elevation of floor inserts and layout for gymnasium equipment. Verify dimensions by field measurements.

## 1.8 COORDINATION

- A. **Coordinate installation of floor inserts** with structural floors and finish flooring installation and with court layout and game lines and markers on finish flooring.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. **Basis of Design:** Contract Documents are based on products specified below to establish a standard of quality. Other available manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.

- 1. Manufacturer: ADP Lemco, Inc.
  - a. Volleyball Equipment:
    - 1) Floor Inserts – designed for gymnasium flooring
    - 2) System: VB5100.

- B. **Available Manufacturers:** Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- 1. ADP Lemco, Inc.
- 2. Jaypro Sports, Inc.
- 3. Porter Athletic Equipment Co.
- 4. Schelde North America.
- 5. Spalding, Russell Brands, LLC.
- 6. Performance Sports Systems (PSS) / Gared

### 2.2 MATERIALS, GENERAL

- A. Anchors, Fasteners, Fittings and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed tamperproof, vandal and theft resistant. Provide as required for gymnasium equipment assembly, mounting, and secure attachment.
- B. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107 with minimum strength recommended in writing by gymnasium equipment manufacturer.

## 2.3 VOLLEYBALL EQUIPMENT

- A. General: Provide equipment complying with requirements in "NFHS Volleyball Rule Book/ USA Volleyball Rule Book."
- B. Floor Insert: Chrome-finished steel floor plate; and steel pipe sleeve, concealed by floor plate, with capped bottom end, sized with ID to fit post standards, not less than 9 inches long to securely anchor pipe sleeve below finished floor in concrete footing; with anchors designed for securing floor insert to floor substrate indicated; quantity as indicated on Drawings.
1. Floor Plate: Self-locking, hinged access cover, recessed to accept finish flooring matching and designed to be level with adjacent flooring. No tools to be required to unlock cover plate.
- C. Post Standards: Provide one set of volleyball posts. Fixed height. Designed for easy removal from permanently placed floor insert supports. Fabricated from extruded-aluminum pipe or tubing, with nonmarking plastic or rubber end cap or floor bumper to protect permanent flooring. Finished with manufacturer's standard factory-applied, baked powder-coating finish complying with finish manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness or plated metal finish.
1. Nominal Pipe or Tubing Diameter: 3-inch OD at base.
  2. Net Height Adjuster: Sliding winch/pulley mechanism designed for infinite height adjustment, complete with fittings; designed for positioning net at heights indicated.
    - a. Net Heights: Between sitting volleyball net height and boys'/men's volleyball net height, 36 and 95-5/8 inches or more.
  3. Height Markers: Clearly marked at regulation play heights for elementary school and high school.
- D. Net: Provide one volleyball nets, sizes as indicated on Drawings.
1. Width and Mesh: Competition volleyball net, 39 inches with 4-inch- square knotless mesh made of black nylon string; tennis net: 42 inch 3.5 mm braided polyethylene net body.
    - a. Hem Band Edges: White, not less than 2-inch- wide top, bottom, and side bindings, not less than 1-inch- wide tension straps at top, bottom and midpoint of each side end of net, end sleeves for dowels, and lines with linkage fittings threaded through top and bottom hems of binding. Provide lengths of lines and linkage fittings as required to properly connect to and set up the net for post standard spacing indicated on Drawings.
      - 1) Top Line: Not less than 1/4-inch- diameter rope.
      - 2) Bottom Line: Not less than 1/4-inch- diameter rope.
  2. Dowels: Not less than 1/2-inch- diameter fiberglass or 1-inch- diameter wood. Provide two dowels per net threaded through each side hem sleeve for straightening net side edges.
  3. Net Antennas: 3/8-inch- diameter, high-tensile-strength, extruded fiberglass or plastic rods, 72 inches long, extending above top hem band of net, with alternating white and red bands according to competition rules. Provide two antennas per net.
    - a. Clamps: Designed to secure antenna to top and bottom of net.
  4. Boundary Tape Markers: 2-inch- wide white strip with sleeve for securing net antenna, secured to net top and bottom with hook-and-loop attachment. Provide two tape markers per net for marking court boundaries.



- E. Net Tensioning System: Designed to adjust and hold tension of net. Fully enclosed, nonslip ratchet-type winch with cable length and fittings for connecting to net lines, positive-release mechanism, and removable handle. Mount net tensioner on post standard at side away from court play. Provide end post with post top pulley. Provide opposing post with welded steel loops, hooks, pins, or other devices for net attachment and post top grooved line guide.
- F. Bottom Net Lock Tightener: Provide manufacturer's standard quick-release-type tension strap, spring-loaded self-locking tensioner, turnbuckle, pulley, or other device and linkage fittings designed to quickly and easily tighten bottom line and/or net.
- G. Safety Pads: Provide pads consisting of not less than 1-1/4-inch- thick, multiple-impact-resistant crosslinked or closed-cell polyethylene foam filler covered by puncture- and tear-resistant, not less than 14-oz. PVC-coated polyester, treated with fungicide for mildew resistance, fabric cover, with fire-test-response characteristics indicated. Provide pads with hook-and-loop closure or attachments for the following components:
  - 1. Post Standards: Wraparound style, designed to totally enclose each standard to a height of not less than 68 inches; 1 per post.
  - 2. Net Lines: Four per net.
  - 3. Fabric Cover Flame-Resistance Ratings: Passes NFPA 701.
  - 4. Fabric Color: As selected by Architect from manufacturer's full range.
- H. Post Standard Transporter: Manufacturer's standard wheeled unit designed for transporting a single post.
- I. Storage Carts: Manufacturer's standard wheeled unit designed for transporting and storing volleyball and tennis equipment and passing through 36-inch- wide or wider door openings. Fabricate units of welded steel tubing with heavy-duty casters, including not less than two swivel casters. Fabricate wheels from materials that will not damage or mark floors; number of units as required to provide transport and storage for specified equipment.
  - 1. Provide sufficient number of carts to store all specified volleyball equipment.
- J. Referee Stand: Manufacturer's freestanding, mobile volleyball chair, designed for use while standing or seated, impact-proof epoxy finish on square tubes, non-marking wheels, collapsible multiplex seat and writing table, fully padded. Provide with hook and loop attachment system.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for play court layout, alignment of mounting substrates, installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.
  - 1. Verify critical dimensions.
  - 2. Examine supporting structure and below finished floor for subgrades, subfloors and footings.
  - 3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements have been clearly marked for installers. Locate reinforcements and mark locations if not already done.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION, GENERAL**

- A. General: Comply with manufacturer's written installation instructions and competition rules indicated for each type of gymnasium equipment. Complete equipment field assembly, where required.
- B. Unless otherwise indicated, install gymnasium equipment after other finishing operations, including painting, have been completed.
- C. Permanently Placed Gymnasium Equipment and Components: Rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated on Shop Drawings; in proper relation to adjacent construction; and aligned with court layout.
  - 1. Floor Insert Location: Coordinate location with application of game lines and markers.
  - 2. Floor Insert Elevation: Coordinate installed heights of floor insert with installation and field finishing of finish flooring and type of floor plate.
- D. Floor Insert Setting: Grout sleeve for post standards in oversized, recessed voids in concrete slabs. Clean holes of debris. Position sleeve and fill void around sleeves with grout, mixed and placed to comply with grout manufacturer's written instructions. Protect portion of sleeve above subfloor from splatter. Verify that sleeves are set plumb, aligned, and at correct height and spacing; hold in position during placement and finishing operations until grout is sufficiently cured. Set insert so top surface of completed unit is flush with finished flooring surface.
- E. Portable Gymnasium Equipment and Components: Assemble in place to verify that equipment and components are complete and in proper working order. Instruct Owner's designated personnel in properly handling, assembling, adjusting, disassembling, transporting, storing, and maintaining units. Disassemble portable gymnasium equipment after assembled configuration has been approved by Architect, and store units in location indicated on Drawings.

### **3.3 ADJUSTING**

- A. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

### **3.4 CLEANING AND PROTECTION**

- A. After completing gymnasium equipment installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions acceptable to manufacturer and Installer that ensure gymnasium equipment is without damage or deterioration at time of Substantial Completion.
- C. Replace gymnasium equipment and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

### **3.5 DEMONSTRATION**

- A. Engage factory-authorized service representatives to train Owner's maintenance personnel to adjust, operate, and maintain gymnasium equipment. Refer to Division 1 Section "Project Closeout."

**END OF SECTION**

## SECTION 11 6643

### INTERIOR SCOREBOARDS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. Types of equipment specified in this section include the following:
  - 1. Scoreboards and control consoles.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, features, and finishes. Include details of anchors, hardware, and fastenings. If applicable, include assembly, disassembly, and storage instructions.
- B. Shop Drawings: Show location and extent of fully assembled equipment. Show location and extent of disassembled equipment and components and transport and storage accessories. Include details not shown in Product Data. Show method of field assembly, connections, installation details, mountings, attachments to other Work, and relationship to adjoining work.
- C. Coordination Drawings: Plans and elevations drawn to scale and coordinating locations of scoreboard equipment with adjacent surfaces.
- D. Samples for Selection: For each type of scoreboard equipment indicated.
- E. Maintenance Data: For scoreboard equipment to include in maintenance manuals.

##### 1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify position and elevation of sports equipment. Verify dimensions by field measurements.

##### 1.5 COORDINATION

- A. Coordinate installation of scoreboard equipment with other finishes and equipment being installed.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other approved manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
1. Manufacturer: Daktronics, Inc.
  2. Products:
    - a. BB-2103; Basketball, volleyball, and wrestling.
    - b. Controller: All Sport 5000, wireless control
      - 1) Provide one radio-frequency control console and, where available, also equip scoreboards and controllers to operate using manufacturer's app for mobile devices – app shall operate all scoreboard functions. (App shall be provided in addition to hand held devices).
- B. Approved Manufacturers: Subject to compliance with requirements of Contract Documents, provide systems by one of the following manufacturers:
1. Daktronics, Inc.; [www.daktronics.com](http://www.daktronics.com)
  2. Nevco; [www.nevco.com](http://www.nevco.com)

### 2.2 GENERAL

- A. Aluminum Faces and Perimeter Frame: Fabricated from 0.063 inch minimum thickness, ASTM B221 aluminum sheet with steel reinforcement and slotted mounting brackets top and bottom.
- B. Finish: Acrylic polyurethane paint. Color as selected by Architect from manufacturer's standard range.
- C. Electronics: Low voltage, solid state, 2-wire cable, multiplex system, quartz crystal controlled. Provide fiber optic communication interface to reduce threat of damage from electrical storms.
- D. LED (Light Emitting Diode) Units: Seven-bar, segmented digits with protective aluminum cover, rated for 100,000 hours, and designed to provide excellent visibility from all angles and sides.
- E. Junction Boxes: Sheet metal box and cover, either 4-1/2 x 2-1/8 x 2-1/8 inches or 6 x 6 x 4 inches complying with NEMA standards.
- F. Control Cable: UL listed, 2-wire, R/G 58/U, coaxial cable, 1/4 inch diameter.

### 2.3 CONTROL CENTERS

- A. Multi-Sport Indoor Console: Scores multiple sports using changeable keyboard inserts, controls multiple scoreboards, stats displays and shot clock; shall work interchangeably on all indoor scoreboards.
1. Features:
    - a. Recalls clock, score, and period information if power is lost
    - b. Runs Time of Day and Segment Timer modes.
  2. Console includes:
    - a. Rugged aluminum enclosure to house electronics
    - b. Sealed membrane water-resistant keyboard

- c. 32-character backlit LCD to verify entries and recall information currently displayed
- d. Power cord that plugs into a standard grounded outlet; 6 watts max
- e. Control cable to connect to the control receptacle junction box (wired system only)
- f. Hand-held switch for main clock start/stop and horn
- g. Soft-sided carrying case
- 3. Accessory Equipment
  - a. 2.4 GHz spread spectrum radio system with frequency hopping technology and 64 non-interfering channels; system includes a transmitter installed inside the console and a receiver installed inside the scoreboard(s).

## 2.4 SCOREBOARDS

- A. Single-sided multi-purpose basketball/volleyball/wrestling electronic scoreboards with integral horn, bonus and possession indicators, changeable captions, and LED displays for period time (to 99.59), scores (to 199), period (to 9), number of player (to 99), player fouls (to 9), and team fouls (to 19); during last minute of period, scoreboard displays time to 1/10 second.
  - 1. Size: 8 feet long x 6 feet high x 6 inches deep.
  - 2. Approximate hanging weight: 180 pounds.
  - 3. Captions: Vinyl applied to display faces
    - a. Home and Guest: 6 inches.
    - b. Period: 4 inches.
  - 1. LED displays: As selected by Architect from manufacturer's full range.
    - a. Clock and score digits: 13 inches high.
    - b. Period digits: 10 inches high.
    - c. Bonus indicators: 4 inches high.
    - d. Possession arrows: 3 inches high.
  - 5. Base Power requirement: 230W; verify actual requirements with manufacturer.
  - 6. Colors: As selected by Architect from manufacturer's full range.
  - 7. Mount scoreboards on walls as shown on scoreboard manufacturer's installation instructions.

## 2.5 CONTROL CABLE AND ACCESSORIES

- A. Provide scoreboard or accessory with control cable of length required by Drawings, not less than 25 feet, and approved shop drawings, junction boxes, mounting hardware, and other accessories as required for complete, functional installation.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for scoreboard installation including alignment of mounting substrates, installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.
  - 1. Verify critical dimensions.
  - 2. Examine supporting structure.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION, GENERAL**

- A. General: Comply with manufacturer's written installation instructions indicated for each type of scoreboard equipment. Complete equipment field assembly, where required.
  - 1. Verify wireless operation of controls. Controllers and scoreboards shall not require a hardwire connection
- B. Unless otherwise indicated, install scoreboard equipment after other finishing operations, including painting, have been completed.
- C. Permanently Placed Scoreboard Equipment and Components: Rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated on Shop Drawings; in proper relation to adjacent construction; and aligned with field layout.

### **3.3 CLEANING AND PROTECTION**

- A. After completing scoreboard equipment installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions acceptable to manufacturer and Installer that ensure scoreboard equipment is without damage or deterioration at time of Substantial Completion.
- C. Replace scoreboard equipment and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

### **3.4 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain scoreboard equipment.

**END OF SECTION**

## SECTION 11 6813

### PLAYGROUND EQUIPMENT

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Freestanding playground equipment.
- B. Related Sections include the following:
  - 1. Section 03 3000 "Cast-in-Place Concrete" for concrete footings.
  - 2. Section 11 6816 "Play Structures" for freestanding play structures with slides, etc.
  - 3. Section 11 6823.13 "Exterior Basketball Equipment" for outdoor basketball equipment.
  - 4. Section 32 1816.13 "Playground Surface Systems" for protective surfacing under and around playground equipment.

##### 1.3 DEFINITIONS

- A. Use Zone: According to ASTM F 1487, "the area beneath and immediately adjacent to a play structure that is designated for unrestricted circulation around the equipment and on whose surface it is predicted that a user would land when falling from or exiting the equipment."

##### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for playground equipment and structures.
- C. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
  - 1. Extent of surface systems and use zones for equipment.
- D. Samples for Selection: For each type of playground equipment and structure indicated.
  - 1. Manufacturer's color charts.
  - 2. Include similar Samples of playground equipment and accessories involving color selection.
- E. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.
- F. Qualification Data: For Installer.
- G. Material Certificates: For the following items, signed by manufacturers:
  - 1. Shop finishes.



- H. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for playground equipment.
- I. Maintenance Data: For playground equipment and finishes to include in maintenance manuals.
- J. Warranty: Special warranty specified in this Section.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Manufacturer Qualifications: A firm whose playground equipment components have been certified by IPEMA's third-party product certification service.
  - 1. Provide playground equipment and play structure components bearing the IPEMA Certification Seal.
- C. Safety Standards: Provide playground equipment complying with or exceeding requirements per ASTM F 1487.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

## 1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of playground equipment which fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures.
    - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 2. Warranty Period: Two years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. **Acceptable Products:** Subject to compliance with requirements of Contract Documents, provide the following equipment. No substitutions will be accepted.
  - 1. Manufacturer: Bison, Inc.
  - 2. Product: Tetherball Set TB100.

### 2.2 TETHERBALL SET

- A. Includes: 1-7/8 inch diameter galvanized steel two-piece pole, PVC ground sleeve for easy pole removal when not in use, rope attachment ring and tetherball with rope. Provide four replacement balls with ropes and attachment clips for Owner's attic stock.

## **2.3 CAST-IN-PLACE CONCRETE**

- A. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" to produce normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi, 3-inch slump, and 1-inch-maximum-size aggregate.

## **2.4 FINISHES, GENERAL**

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## **2.5 ALUMINUM FINISHES**

- A. Baked-Enamel Finish: Prepare, treat, and coat metal to comply with paint manufacturer's written instructions and as follows:
  - 1. Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603 except with a minimum dry film thickness not less than 3 to 5 mils, medium gloss.
- B. PVC Finish: Manufacturer's standard, UV-stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on, PVC-plastisol finish, with flame retardant added, complying with coating manufacturer's written instructions for pretreatment, application, and minimum dry film thickness of 100 mils.
- C. Color: Multiple colors as selected by Architect from manufacturer's full range.

## **2.6 IRON AND STEEL FINISHES**

- A. Galvanizing: Hot-dip galvanize products made from rolled-, pressed-, and forged-steel shapes, castings, plates, bars, and strips indicated to be galvanized to comply with ASTM A 123/A 123M.
  - 1. Hot-dip galvanize steel and iron hardware indicated to be galvanized to comply with ASTM A 153/A 153M.
  - 2. Galvanized Steel Sheet: Commercial steel sheet, hot-dip galvanized, complying with ASTM A 653/A 653M for not less than G60 (Z180) coating designation; mill phosphatized.
- B. Powder-Coat Finish: Prepare, treat, and coat ferrous metal to comply with resin manufacturer's written instructions and as follows:
  - 1. Apply thermosetting polyester or acrylic urethane powder coating with cured-film thickness not less than 1.5 mils.
- C. PVC Finish: Manufacturer's standard, UV-stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on, PVC-plastisol finish, with flame retardant added, complying with coating manufacturer's written instructions for pretreatment, application, and minimum dry film thickness of 100 mils.

- D. Color: Multiple colors as selected by Architect from manufacturer's full range.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, site surface and subgrade drainage, and other conditions affecting performance.
  - 1. Do not begin installation before final grading required for placing protective surfacing is completed, unless otherwise permitted by Architect.
  - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Verify locations of playground perimeter and pathways. Verify that playground layout and equipment locations comply with requirements for each type and component of equipment.

### **3.3 INSTALLATION, GENERAL**

- A. General: Comply with manufacturer's written installation instructions, unless more stringent requirements are indicated. Anchor playground equipment securely, positioned at locations and elevations indicated.
  - 1. Maximum Equipment Height: Coordinate installed heights of equipment and components with finished elevations of protective surfacing. Set equipment so fall heights and elevation requirements for age group use and accessibility are within required limits. Verify that playground equipment elevations comply with requirements for each type and component of equipment.
- B. Post and Footing Excavation: Excavate holes for posts and footings as indicated in firm, undisturbed or compacted subgrade soil.
- C. Post Set with Concrete Footing: Comply with ACI 301 for measuring, batching, mixing, transporting, forming, and placing concrete.
  - 1. Set equipment posts on concrete footing. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at the correct angle, alignment, height, and spacing.
  - 2. Embedded Items: Use setting drawings and manufacturer's written instructions to ensure correct installation of anchorages for equipment.
  - 3. Concrete Footings: Smooth top, and shape to shed water.

**END OF SECTION**

## SECTION 11 6816

### PLAYGROUND STRUCTURES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. Section includes freestanding playground structures.
- B. Related Sections include the following:
  - 1. Section 03 3000 "Cast-in-Place Concrete" for concrete footings.
  - 2. Section 11 6813 "Playground Equipment" for tetherball and other games.
  - 3. Section 11 6823.13 "Exterior Basketball Equipment" for outdoor basketball backstops (8 feet high and 10 feet high).
  - 4. Division 31 Sections for filling and grading work.
  - 5. Section 32 1813 "Synthetic Grass" for ground finishes in play areas
  - 6. Section 32 1816 "Playground Surface Systems" for protective poured surfacing under and around playground equipment.
  - 7. Section 32 3000 "Site Furnishings" for benches installed at playground areas and courtyards.

##### 1.3 DEFINITIONS

- A. Composite Play Structures: According to ASTM F 1487, this means "two or more play structures, attached or functionally linked," creating one integral unit with more than one play activity.
- B. Critical Height: Standard measure of shock attenuation. According to CPSC No. 325, this means "the fall height below which a life-threatening head injury would not be expected to occur."
- C. Fall Height: According to ASTM F 1487, this means "the vertical distance between a designated play surface and the protective surfacing beneath it." The fall height of playground equipment should not exceed the Critical Height of the protective surfacing beneath it.
- D. HDPE: High-density polyethylene.
- E. IPEMA: International Play Equipment Manufacturers Association.
- F. LLDPE: Linear low-density polyethylene.
- G. MDPE: Medium-density polyethylene.
- H. Play Structure: According to ASTM F 1487, this is "a free-standing structure with one or more components and their supporting members."

- I. Protective Surfacing: According to ASTM F 1487, this means impact-attenuating "materials to be used within the use zone of any playground equipment" for playground surface systems.
- J. PVC: Polyvinyl chloride.
- K. Transfer Point: According to ASTM F 1487, this is "a platform or deck along an accessible route of travel or an accessible platform provided to allow a child in a wheelchair to transfer from the chair onto the equipment."
- L. Use Zone: According to ASTM F 1487, this is "the area beneath and immediately adjacent to a play structure that is designated for unrestricted circulation around the equipment and on whose surface it is predicted that a user would land when falling from or exiting the equipment."

#### **1.4 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For each type of playground equipment, include materials, plans, elevations, sections, details, method of field assembly, connections, and installation details. Indicate capacity and number of play activities.
- C. Coordination Drawings: Layout plans and elevations drawn to scale and coordinating playground equipment with playground surface systems. Show playground equipment locations, use zones, fall heights, extent of protective surfacing, and Critical Heights.
- D. Samples for Selection: Manufacturer's color charts or 6-inch (150-mm) lengths of actual units showing the full range of colors and textures available for components with factory-applied color finishes.
- E. Product Certificates: Signed by manufacturers of playground equipment certifying that products furnished comply with requirements.
- F. Manufacturer Certificates: Signed by manufacturers certifying that they comply with requirements.
- G. Maintenance Data: For playground equipment and finishes to include in maintenance manuals specified in Division 1.

#### **1.5 QUALITY ASSURANCE**

- A. Installer Qualifications: An experienced installer who has specialized in installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer of playground equipment.
- B. Manufacturer Qualifications: A firm whose playground equipment components have been certified by IPEMA's "3rd Party Certification" service.
  - 1. Provide only playground equipment and play structure components bearing the IPEMA Certification Seal.

- C. Standards and Guidelines: Provide playground equipment complying with or exceeding requirements in the following:
1. ASTM F 1487.
  2. CPSC No. 325, "Handbook for Public Playground Safety."

## 1.6 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Architect at least two days in advance of proposed utility interruptions.
  2. Do not proceed with utility interruptions without Architect's written permission.
  3. Before excavating, contact utility-locator service for area where Project is located.

## 1.7 COORDINATION

- A. Coordinate construction of equipment use zones and fall heights during installation of playground equipment with installation of protective surfacing specified in Sections 32 1813 "Synthetic Grass" and 32 1816 "Playground Surface Systems." Sequence work so protective surfacing can be installed immediately after concrete footings have set.

## PART 2 - PRODUCTS

### 2.1 PRODUCTS AND MANUFACTURERS

- A. Basis of Design: Contract Documents are based on product specified below to establish a standard of quality. Other manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
1. Manufacturer – Kindergarten Play Area: Miracle Recreation;  
[www.miracle-recreation.com](http://www.miracle-recreation.com)
    - a. Products:
      - 1) "Tot Rock Climber" model 718787
      - 2) "Bell" model 718796P1.
      - 3) "Side-by-Side Slide" mode 718700.
      - 4) "3 Foot Deck" model 7185029, provide three units
      - 5) "Pilot" model 7187147
      - 6) "Square Roof" model 7188614.
      - 7) "3 Foot Straight Crawl Tube" model 7188654
      - 8) "6 Foot Ski Slide with Canopy" model 718874
      - 9) "Vertical Ladder" model 7188153
      - 10) "L Slide" model 7189071
      - 11) "Steering Wheel (Post Mount) model 718900P1.
      - 12) "TC Interactive Panel Frame Only" model 71871520
      - 13) "Magical Music Insert" model 714715206'
      - 14) "Transfer Point" model 71885139.
      - 15) "Sensory Panel – Textured Star Circle (Below Deck)  
model 71871311B
      - 16) "Sensory Panel - Textured Square Oval (Below Deck)  
Model 7181313B
      - 17) "Sensory Panel – Textured Triangle Hexagon (Below Deck)  
Model 71871312B
      - 18) "Mini City Playhouse", model MR0882

2. Manufacturer – Big Toy Area: Miracle Recreation; [miracle-recreation.com](http://miracle-recreation.com).
  - a. Products:
    - 1) “Alpha Climber” model 4333.
    - 2) “Ski Slide” model 704910.
    - 3) “Tic-Tac-Toe” model 7047632B.
    - 4) “Saddle Seat Straight Post” model 9452, provide two units.
    - 5) “Bongo Perch” model 7047721, provide three units.
    - 6) “Sing Language” model 70471510.
    - 7) “Kids’ Perch with Extended Wheel model 70499269A.
    - 8) “Stairs 3 Foot Rise” model 7048819
    - 9) “Vertical Ladder” model 704815.
    - 10) “360 Typhoon Slide” model 70474859.
    - 11) “Fun Fone” models 704994Z and 704994.
    - 12) “5 Foot Deck” model 7045029.
    - 13) “2 Foot Deck” model 7047039.
    - 14) “1 Foot Deck” model 7045039.
    - 15) “Calypso 3 Drum” model 70471513
    - 16) “PVC Ramp” model 704920595, provide three units.
    - 17) “Marble Race” model 7049831
    - 18) “Chameleon II Slide” model 704670P, provide two units.
    - 19) “1’-6” Deck” model 7045039
    - 20) “Critter Puzzle” model 7047631.
    - 21) “Treehouse Roof” model 7047306.
    - 22) “Motor Skills” model 7049832.
    - 23) “Pilot with Window” model 7047146
    - 24) “Twin Rider” model 6081.
    - 25) “Chaos Climber” model 4543.
    - 26) “Ten Spin – Sales Item” model 304W
    - 27) “Saddle Seat Angled Post” model 9451.
    - 28) “ADA Stairs 18 Inch Rise” model 7189939, provide two units.
    - 29) “Crunch Station: model 718782
    - 30) “Spiral Climber” model 718969
    - 31) “Groove II Slide” model 7186385, provide two units.
    - 32) “5 Foot Deck” model 7185029
    - 33) “6’-6” Deck” model 7185019.
    - 34) “5 Foot Honeycomb Climber” model 7187555E
    - 35) “8 Foot Deck” model 7185029
    - 36) “Climbing Pole” model 7188088
    - 37) “Transfer Point” model 71885159.
    - 38) “Bench” model 7188172B
3. Manufacturer: Percussion Play; [www.percussionplay.com](http://www.percussionplay.com)
  - a. Kindergarten Play Area:
    - 1) Cavatina
    - 2) Cherub
    - 3) Penta Post
    - 4) Rainbow Sambas
  - b. Big Toy Area
    - 1) Cavatina
    - 2) Cherub
    - 3) Colossus Chimes
    - 4) Rainbow Sambas

## **2.2 PLAYGROUND EQUIPMENT, GENERAL**

- A. Configure components as per manufacturer's drawings.
- B. Colors: As selected by Architect from manufacturer's full range.

## **2.3 MATERIALS**

- A. **General:**
  - 1. Exposed hardware: Stainless steel or Delta coated for corrosion protection.
  - 2. Footing pipes shall have galvanized flange at bottom for positive retention.
  - 3. Polyethylene: UV stabilized for exterior use.
  - 4. Steel: Hot-dipped galvanized.

## **2.4 FABRICATION**

- A. General: Provide sizes, strengths, thicknesses, wall thickness, and weights of components as indicated but not less than required to comply with structural performance and other requirements in ASTM F 1487. Factory drill components for field assembly. Unnecessary holes in components, not required for field assembly, are not permitted. Provide complete play structure, including supporting members and connections, means of access and egress, designated play surfaces, barriers, guardrails, handrails, handholds, and other components indicated or required to comply with referenced standard[s] for equipment indicated.
- B. Metal Frame: Fabricate main-frame upright support posts from metal pipe or tubing with cross-section profile and dimensions as indicated. Fabricate secondary frame members, bracing, and connections from either steel or aluminum. Unless otherwise indicated, provide each pipe or tubing main-frame member with manufacturer's standard drainable bottom plate or support flange.
- C. Composite Frame: Fabricate main-frame upright support posts from metal and plastic with profile and dimensions as indicated. Fabricate secondary frame members, bracing, and connections from either steel or aluminum.
- M. Steel and Iron Components: Galvanized, galvanized and color coated, or color coated. Bare metal steel or iron components are not permitted.
  - 1. Color-Coated Pipe and Tubing for Main Frame: Galvanized before applying polyurethane rubber coating.

## **2.5 CAST-IN-PLACE CONCRETE**

- A. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" to produce normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi, 3-inch slump, and 1-inch- maximum size aggregate.

## **2.6 METAL FINISHES, GENERAL**

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating metal finishes.



- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.7 ALUMINUM FINISHES

- A. Mill Finish: Manufacturer's standard mill finish.

## 2.8 STEEL AND GALVANIZED STEEL FINISHES

- A. PVC Finish: Manufacturer's standard, UV-stabilized, mold-resistant, slip-resistant,-matte-textured, dipped or sprayed-on, polyurethane rubber, with flame retardant added, complying with coating manufacturer's written instructions for pretreatment, application, and minimum dry film thickness of 120 mils (3 mm).

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. **Examine areas and conditions**, with Installer present, for compliance with requirements for site clearing, earthwork, site surface and subgrade drainage, and other conditions affecting performance.
  - 1. Do not begin installation before final grading required for placing protective surfacing is completed, unless otherwise permitted by Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Verify locations of playground perimeter and pathways. Verify that playground layout and equipment locations comply with requirements for each type and component of equipment.

### 3.3 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written installation instructions, unless more stringent requirements are indicated. Anchor playground equipment securely, positioned at locations and elevations indicated on Shop Drawings.
  - 1. Maximum Equipment Height: Coordinate installed heights of equipment and components with installation of protective surfacing. Set equipment so fall heights and elevation requirements for age group use and accessibility are within required limits. Verify that playground equipment elevations comply with requirements for each type and component of equipment.
- B. Post and Footing Excavation: Hand-excavate holes for posts and footings to dimensions, profile, spacings, and in locations indicated on Drawings, in firm, undisturbed or compacted subgrade soil. Level bearing surfaces with drainage fill to required elevation.

- C. Post Setting: Set main-frame equipment posts in concrete footing. Protect portion of posts above footing from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Verify that posts are set plumb or at the correct angle and are aligned and at the correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
  - 1. Concrete Footings: Smooth top, and shape to shed water.

### 3.4 ADJUSTING

- A. Adjust movable playground equipment components to operate smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range.

### 3.5 CLEANING

- A. After completing playground equipment installation, **inspect components**. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

**END OF SECTION**

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## SECTION 11 6823.13

### EXTERIOR BASKETBALL EQUIPMENT

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following gymnasium equipment:
  - 1. Outdoor basketball equipment.
- B. Related Sections include the following:
  - 1. Section 11 6813 "Playground Equipment" for tetherball and "toss n' score" activity structures as well as freestanding playground equipment.
- C. Products furnished, but not installed under this Section, include insert sleeves for inserts to be cast in concrete pavement and footings.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, features, and finishes. Include details of anchors, hardware, and fastenings. If applicable, include assembly, disassembly, and storage instructions.
- B. Shop Drawings: Show location and extent of fully assembled gymnasium equipment. Show location and extent of disassembled equipment and components and transport and storage accessories. Include elevations, sections, and details not shown in Product Data. Show method of field assembly, connections, installation details, mountings, floor inserts, attachments to other Work, operational clearances, and relationship to adjoining work.
  - 1. Setting Drawings: For cast-in floor insert sleeves for post standards.
- C. Coordination Drawings: Court layout plans and elevations drawn to scale and coordinating game lines and markers applied to paved surfaces with basketball backstops.
- D. Samples for Selection: For each type of equipment indicated.

##### 1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify position and elevation of basketball equipment. Verify dimensions by field measurements.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS - BASKETBALL EQUIPMENT**

- A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other available manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
1. Manufacturer: Spalding Equipment.
  2. Components:
    - a. Supports: Model 401-807.
    - b. Aluminum Backboards: Model 413-222.
    - c. Goal: Gared double rim; furnish complete with net.
- B. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. AL, Inc.; ADP Lemco, Inc.
  2. Jaypro Sports, Inc.
  3. Porter Athletic Equipment Co.
  4. Spalding Equipment.

### **2.2 MATERIALS, GENERAL**

- A. Steel: Comply with the following:
1. Steel Plates, Shapes, and Bars: ASTM A 36, hot-dip galvanized.
  2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53.
  3. Cold-Formed Steel Tubing: ASTM A 500, Grade A, unless another grade is required by structural loads.
  4. Steel Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513 or steel tubing fabricated from steel complying with ASTM A 569 and complying with the dimensional tolerances in ASTM A 500.
  5. Malleable-Iron Castings: ASTM A 47, grade required by structural loads.
- D. Anchors, Fasteners, Fittings and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed tamperproof, vandal and theft resistant. Provide as required for equipment assembly, mounting, and secure attachment.
- E. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107 with minimum strength recommended in writing by equipment manufacturer.

### **2.4 OUTDOOR BASKETBALL EQUIPMENT**

- A. Upright post shall be 4-1/2 inch O.D. heavy wall galvanized steel pipe gooseneck style. Provide with anchor lugs on lower end for securing into concrete footing. Backboard shall be supported 5'-0" in front of center upright support.
1. Furnish basketball standards in both 8 feet and 10 feet heights; locate as shown on Drawings.

- B. Basketball Backboard: Provide predrilled holes or preset inserts for mounting goals.
  - 1. Description: Fan shaped, 54-inch maximum width by 39-inch maximum height, fabricated from the following:
    - a. Aluminum: Cast with 1-1/2-inch- deep, roll-edged perimeter flange and integral reinforcing ribs; with integral, tapped mounting holes or cast-in threaded steel inserts for threaded fasteners for mounting backboard to backstop at standard mounting centers.
  - 2. Target Area and Border Markings: Marked in orange, with manufacturer's standard pattern and stripe width.
  - 3. Finish: Manufacturer's standard factory-applied, white background.
  
- C. Double Rim Goals:
  - 1. Rim: 5/8 inch diameter cold drawn alloy steel round (top) and 1/2 inch diameter steel (bottom) formed to an 18 inch inside diameter ring.
  - 2. Position inside of ring 6 inches from face of backboard by a heavy, L-shaped, formed steel mounting plate with 5 inch x 5 inch mounting hole centers for front mounting on backboard.
  - 3. Rigidly brace rim by means of a 1/2 inch diameter cold drawn alloy steel round formed and welded in position.
  - 4. Provide rim with twelve "no-tie" net attachment clips for net attachment.
  - 5. Goal Finish: Durable, official orange powder coat finish.
  - 6. Furnish goal complete with a high quality nylon net and plated mounting hardware

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for play court layout, alignment of mounting substrates, installation tolerances, and other conditions affecting performance.
  - 1. Verify critical dimensions.
  
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION, GENERAL**

- A. General: Comply with manufacturer's written installation instructions and competition rules indicated for each type of gymnasium equipment. Complete equipment field assembly, where required.
  
- B. Unless otherwise indicated, install gymnasium equipment after other finishing operations, including painting, have been completed.
  
- C. Permanently Placed Gymnasium Equipment and Components: Rigid, level, plumb, square, and true; anchored securely; positioned at locations and elevations indicated on Shop Drawings; in proper relation to adjacent construction; and aligned with court layout.
  
- D. Connections: Connect automatic operators to building electrical system.

### **3.3 ADJUSTING**

- A. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

### **3.4 CLEANING AND PROTECTION**

- A. After completing equipment installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions acceptable to manufacturer and Installer that ensure equipment is without damage or deterioration at time of Substantial Completion.
- C. Replace equipment and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

**END OF SECTION**

**SECTION 11 7313**  
**ADULT CHANGING TABLE**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Adjustable changing table.

**1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of accessory specified, with installation instructions for each unit built-in or connected to other construction. Include methods of installation for each type of substrate.
- B. Shop Drawings: Showing installation details of accessories permanently affixed to construction, including full-scale installation details of special conditions.
  - 1. Include details of components. Indicate location and size of each field connection.
  - 2. Include diagrams for service connections and power, signal, and control wiring.

**1.3 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For products to include in operation and maintenance manuals. Include precautions against materials and methods which may be detrimental to finishes and performance.

**1.4 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Firm (material producer) with not less than 3 years of production experience, whose published literature clearly indicates general compliance of products with requirements of this section.
- B. Single Source Responsibility: Provide material produced by a single manufacturer for each accessory type.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials to project site in original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, and lot number. Store materials in original undamaged packages and containers, inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity; laid flat, blocked off ground to prevent sagging and warping.
- B. Comply with instructions and recommendations of manufacturer for special delivery, storage, and handling requirements.



## 1.8 SEQUENCE AND SCHEDULING

- A. Sequence accessory installation with other work to minimize possibility of damage and soiling during remainder of construction period.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Sheet Steel: Cold rolled, commercial quality, ASTM A 366, minimum 20 gauge unless otherwise indicated. Surface preparation and metal pretreatment as required for applied finish.
- B. Painted Finish: Baked acrylic enamel coating.
- C. Fasteners: Screws, bolts or other exposed devices of same material as accessory unit, or of galvanized steel where concealed. Equip items with theft-proof fasteners where accessible to tampering.

### 2.2 FABRICATION, GENERAL

- A. Provide accessory items, permanently installed, equipped with functions as specified. Fabricate units with tight seams and joints, exposed metal edges rolled. Manufacturer or product identification on exposed surfaces is unacceptable. Provide products with smooth welds, consistent finish with no evidence of wrinkling, chipping, uneven coloration, dents, or other imperfections.

### 2.3 HEIGHT ADJUSTABLE CHANGING TABLE

- A. Basis of Design: Contract Documents are based on product specified below to establish a standard of quality. Other products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.:
  - 1. Manufacturer: Pressalit (Denmark); distributed by MAX-ability; [www.max-ability.com](http://www.max-ability.com).
  - 2. Product: Pressalit Care 3000
- B. Characteristics:
  - 1. Wall mounted unit; fold to wall for storage.
  - 2. Dimensions:
    - a. Mattress (one piece): 31 inches x 75-1/4 inches
    - b. Unit projection from wall: folded: 9-1/2 inches; extended: 34-1/2 inches
    - c. Height range: 11.81 inches to 39.37 inches.
    - d. Weight capacity: 463 lbs maximum.
  - 3. Construction: Powder-lacquered stainless steel; elasticized netting. Components: Water compatible for showering and cleaning.
    - a. Integrated water receiver tray and flexible drain assembly.
    - b. All parts and surfaces accessible for cleaning and disinfecting.
    - c. Mattress: Removable, 3-piece polyurethane.
      - 1) Mattress Color: Manufacturer's standard gray
  - 4. Power Requirements: 120V wall outlet. Internal power draw: 24V/1A via built-in transformer with 8 ft power cord. Linak control and actuator system; chain drive. Hand held remote control with wall bracket.

5. Lifting Speeds:
  - a. Unloaded: Up: 0.70 inch per second; down 0.78 inch per second.
  - b. Loaded with 175 lbs: Up: 0.59 inch per second; down: 0.78 inch per second.
6. Provide with integrated hinged safety rail. Provide with dual safety locks in “up” position.

## **2.6 FINISHES**

- A. Provide materials in colors and finishes as selected by Architect from manufacturer's premium finishes.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. **Verify** materials are those specified before installing.
- B. Install accessories after other finishing operations, including painting, have been completed.
- C. Wall-Mounted Accessory Units: Install accessories complying with manufacturer's printed instruction, using fasteners as recommended by manufacturer as appropriate to substrate.
  1. Fasten wall plates to full height doubled studs. Brace wall above ceiling.
- D. Permanently Placed Equipment and Components: Rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated on Shop Drawings; in proper relation to adjacent construction; and aligned with room layout.
- E. Anchoring to In-Place Construction: Use anchors and fasteners where necessary for securing built-in and permanently placed equipment and components to structural support and for properly transferring load to in-place construction.
- F. Adjust accessory items for proper operation. Clean and polish exposed surfaces, using materials and methods recommended by the manufacturer.

### **3.2 ADJUSTING**

- A. Adjust products for proper function and operation to comply with manufacturer's written instructions.

### **3.3 PROTECTION**

- A. Protect accessories against damage during remainder of construction period, complying with manufacturer's directions.
- B. Repair damaged products according to manufacturer's written instructions. If damaged products cannot be successfully repaired, as determined by Architect, remove and replace damaged products.

### **3.4 TRAINING**

- A. Provide training to Owner's staff on operation and maintenance of adult changing table. Allocate at least one 8-hour day to demonstrate proper use of equipment.

**END OF SECTION**

**SECTION 11 7913**  
**THERAPY SWINGS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section Includes:
  - 1. Overhead mounted net swing, with net adaption kit.
  - 2. Overhead mounted platform swing.
  - 3. Rotational device.
- B. Related Requirements:
  - 1. Section 05 5000 "Metal Fabrications" for above-ceiling supplementary framing for support and anchorage of patient-lift systems.

**1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.

**PART 2 - PRODUCTS**

**2.1 CEILING-MOUNTED THERAPY SWING**

- A. Ceiling-Mounted Swing: Consisting of net with padded seat and spreader bar.
  - 1. Basis of Design: Contract Documents are based on products of manufacturer specified below to establish a standard of quality. Other manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
    - a. Manufacturer: Southpaw Enterprises; [www.southpaw.com](http://www.southpaw.com)
    - b. Products:
      - 1) Southpaw Therapy Net and Net Adaptation Kit with Spreader Bar
      - 2) Southpaw Platform Swing with Vinyl Padded Platform
      - 3) Safety Rotational Device, with safety snap.
- B. Net: Manufacturer's standard, with 200 lb. working load; 48 inches high, with two welded steel rings for attachment to rotational device or spreader bar.
- C. Net Adaptation Kit: Includes padded seat, top spreader bar with two retaining pins.

- D. Platform Swing: 60 inches H x 31 inches L x 31 inches W with padded edge and vinyl pad; furnish with height adjuster
- E. Rotational Device: Manufacturer's standard device, designed to allow 360 degree rotation; attaches to structural hook above with safety carabiner, furnished with rotational device..

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 CEILING-MOUNTED THERAPY SWING**

- A. Install swings according to manufacturer's written instructions.

### **3.3 ADJUSTING**

- A. Adjust products for proper function and operation to comply with manufacturer's written instructions.

### **3.4 PROTECTION**

- A. Protect installed products from damage for the remainder of the construction period.
- B. Repair damaged products according to manufacturer's written instructions. If damaged products cannot be successfully repaired, as determined by Architect, remove and replace damaged products.

**END OF SECTION**

## SECTION 11400

### FOOD SERVICE EQUIPMENT

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION OF WORK

- A. The extent of Food Service Equipment is shown on the drawings and by schedules and equipment lists.

##### 1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract documents, including General and Supplementary Conditions and Division 1- Specification sections apply to work of this section.
- B. Bidder is responsible for information and requirements located and identified on every part of the contract plans and specifications.
- C. Mechanical and Electrical Work: Refer to this project's specification sections Division 15 and Division 16, respectively, for mechanical and electrical services and connections for individual items of Food Service Equipment.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Submit (1) complete electronic set, prior to ordering and/or fabrication, of manufacturer's or shop fabricator's product information and installation instructions for each item of Food Service Equipment.
- B. Shop Drawings: For fabricated equipment. Submit (1) complete electronic set of documents, prior to ordering and/or fabrication, of shop drawings showing layouts, elevations, sections and details of custom fabricated work (work not shown by manufacturer's standard product data sheets). Show plan layouts at ¼" scale, elevations at ½" scale and details at 1 ½" or larger scales, as required.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Coordination Drawings: For foodservice facilities. Submit (1) complete electronic set, prior to ordering and/or fabrication, of manufacturer's or shop fabricator's product information and installation instructions for each item of Food Service Equipment.
  - 1. Indicate locations of foodservice equipment and connections to utilities.
  - 2. Key equipment using same designations as indicated on Drawings.
  - 3. Include plans and elevations; clearance requirements for equipment access and maintenance; details of equipment supports; and utility service characteristics.
- E. Operation and maintenance data. Submit (1) complete electronic set and (3) three sets of bound maintenance manuals, operating instructions, spare parts list, precautions against hazards, manufacturer's warranties and similar information. Distribute an additional copy of installation and start-up instructions to the installer. Mark each data sheet or brochure with the project name and applicable project equipment number(s)
- F. Sample warranties.

## 1.4 QUALITY ASSURANCE

- A. NSF Standards: Provide equipment that bears NSF Certification Mark or UL Classification Mark certifying compliance with applicable NSF standards.
- B. BISSC Standards: Provide bakery equipment that complies with BISSC/Z50.2.
  - 1. Provide BISSC-certified equipment.
- C. UL Certification: Provide electric and fuel-burning equipment and components that are evaluated by UL for fire, electric shock, and casualty hazards according to applicable safety standards, and that are UL certified for compliance and labeled for intended use.
- D. Steam Equipment: Provide steam-generating and direct-steam heating equipment that is fabricated and labeled to comply with ASME Boiler and Pressure Vessel Code.
- E. Regulatory Requirements: Install equipment to comply with the following:
  - 1. ASHRAE 15, "Safety Code for Mechanical Refrigeration."
  - 2. NFPA 54, "National Fuel Gas Code."
  - 3. NFPA 70, "National Electrical Code."
  - 4. NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations."
- F. Seismic Restraints: Comply with SMACNA's "Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines," Appendix A, "Seismic Restraint Details," unless otherwise indicated.
- G. Pre-installation Conference: Conduct conference at General Contractor trailer at jobsite to coordinate with all trades involved in food service equipment implementation

## 1.5 WARRANTY

- A. Refrigeration Compressor Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace compressors that fail in materials or workmanship within specified warranty period.
  - 1. Failure includes, but is not limited to, inability to maintain set temperature.
  - 2. Warranty Period: One year from date of Substantial Completion.

## 1.6 PRODUCT HANDLING

- A. Protect metal finishes from damage during shipping, storage, handling, installation and construction of other work in the same space. Wrap and crate each item of equipment as needed for protection from damage. Covers exposed stainless steel surfaces with self-adhesive protective paper, of a type recommended by the metal manufacturer, and do not remove until work is installed and ready for cleaning and start-up.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

#### A. Metals:

1. Stainless Steel (S/S): AISI Type 302/304, hardest workable temper, No. 4 directional polish.
2. Galvanized Steel Sheet (G.I.): ASTM A526, except ASTM A527 for extensive forming; ASTM A525, G90 zinc coating, chemical treatment. Where painted finish is indicated, provide mill-phosphatized treatment in lieu of chemical treatment.
3. Steel Sheet: ASTM A 569 hot-rolled carbon steel.
4. Galvanized Steel Pipe: ASTM A53 or ASTM A120, welded or seamless, schedule 40, galvanized.
5. Steel Structure Members: Hot rolled or cold formed, carbon steel unless stainless is indicated.
6. Galvanized Finish (G.I): ASTM A123 hot-dipped zinc coating applied after fabrication.
7. Aluminum: ASTM B209/B221 sheet, plate and extrusions (as indicated); alloy, temper and finish as determined by manufacturer/fabricator, except 0.40-mil natural anodized finish on exposed work unless another finish is indicated.

#### B. Plastic Laminate:

1. NEMA LD3, Type 2, 0.051" thick, except Type 3, 0.042" for post-forming smooth (non-texture) white unless another texture and color is indicated or selected by Architect. Comply with NSF No. 35 where applicable.

#### C. Hardwood Work Surfaces:

1. Laminated edge-grained hard maple (*Acer saccharum*), NHLA First Grade with Knots, holes and other blemishes culled out, kiln dried at 8% or less moisture, waterproof glue, machined, sanded, and finished with NSF approved oil-sealer.

#### D. Insulation:

1. Cooled Component Insulation: Rigid, closed-cell polyurethane foam; either heat-aged slab stock for adhesive lamination with face sheets, or foamed in place using Freon 11 as expanding agent; k-value of 0.15; not less than 1.7 lbs. Per cu ft. density.
2. Heated-Component Insulation: Rigid board, semi-rigid blanket or adhesive applied blanket of glass fiber or other mineral fiber insulation, certified by manufacturer to withstand long-term exposure to heat (temperature rating of each insulated equipment item) without deterioration. K-value of not more than 0.30; density of not less than 1.5 lbs. Per cu. Ft.

#### E. Joint Materials:

1. Sealant: 1-part or 2-part, polyurethane or silicone based, liquid elastomeric sealant, non-solvent release type, Shore A hardness of 30 except 45 if subject to traffic.
2. Backer Rod: Polyurethane rod stock, larger than joint width.
3. Gaskets: Solid or hollow (but not cellular) neoprene or polyvinyl chloride; light gray, minimum of 40 Shore A hardness, self-adhesive or prepared for either adhesive application or mechanical anchorage.



- F. Paint and Coatings:
  - 1. Provide the types of painting and coating materials which, after drying or curing are suitable for use in conjunction with foodservice, and which are durable, non-toxic, non-dusting, non-flaking, mildew resistant, and comply with governing regulations for Food Service.
  
- G. Sound Deadening:
  - 1. Heavy-bodied resinous coating, filled with granulated cork or other resilient material, compounded for permanent, non-flaking adhesion to metal in a 1/8" thick coating.
    - a. Galvanized Repair Paint: MIL-P-21035.
    - b. Pretreatment: SSPC-PT2 or PT3, or FT C490.
  - 2. Primer Coating for Metal: FS TT-P-86 type suitable for baking where indicated.
  - 3. Enamel for Metal: Synthetic types, FS TT-P-491, type suitable for baking where indicated.

## 2.2 FABRICATED PRODUCTS

- A. Hardware:
  - 1. General: Manufacturer's standard, but not less than ANSI 156.9 Type 2 (Institutional), satin finish stainless steel or dull chrome finish on brass, bronze or steel.
    - a. Cabinet Catches: Heavy-duty magnetic type, except as otherwise indicated.
    - b. Drawer Slides: Ball bearing type, side-mounting, self-closing, 250 lb. capacity.
    - c. Sliding Door Hardware: Overhead track with tandem nylon wheel hangers for door leaves over 5 sq. ft. area; roller less sanitary slides for smaller doors (comply with NSF standards).
  
- B. Casters:
  - 1. Type and size as recommended by caster manufacturer, NSF approved, for the type and weight of equipment supported; but not less than 4" diameter with 15/16" tread width, with sealed self-lubricating ball bearings, cadmium-plated steel disc wheels and solid light-gray synthetic rubber tires. Provide stainless steel horns and accessories. Unless otherwise indicated, equip each item with 2 swivel-type casters and 2 fixed casters, and provide foot brakes on 2 casters on opposite corners of equipment.
    - a. Caster Bumpers: Unless equipment item is equipped with another form of all-around protective bumper provide circular rotating bumper above each caster, 5" diameter tire of light gray synthetic rubber (hollow or closed-cell) on cadmium-plated disc.
  
- C. Plumbing Fittings, Trim and Accessories:
  - 1. General: Where exposed or semi-exposed, provide bright chrome-plated brass or polished stainless steel units. Provide copper or brass where not exposed.
  
- D. Water Outlets:
  - 1. Water Fill Devices: At sinks and at other locations where water is supplied (by manual, automatic or remote control), provide commercial quality faucets, valves, dispensers or fill devices, of the type and size indicated, and as required to operate as indicated.
  - 2. Vacuum Breakers: Provide with Food Service Equipment where specified/required.

3. Waste Fittings: Except as otherwise indicated, provide 2" remote-lever waste valves, and 3.5" strainer basket. Integrate unit for direct connection with waste grinder where indicated.
  4. P-Traps: Include removable P-traps where drains are indicated for direct connection to drainage system.
- E. Electrical Materials:
1. General: Provide standard materials, devices and components as recommended by the manufacturer/fabricator, selected and installed in accordance with NEMA standards and recommendations; and as required for safe and efficient use and operation of the Food Service Equipment without objectionable noise, vibration and sanitation problems.
    - a. Controls and Signals: Provide recognized and commercial grade signals, "on-off" push button or switches, and other speed and temperature controls as required for operation, complete with pilot lights and permanent signs and graphics to assist the user of each item. Provide stainless steel cover plates at control and signal electrical boxes.
    - b. Connections: Equip each item requiring electrical power with either a terminal box for permanent connection or cord-and-plug for interruptible connection as indicated. Provide standard ground-type plugs, matching outlets (specified in Division 15), light gray (plug and cord)
    - c. Motors: Totally enclosed type, except drip-proof type where not exposed to a dust or moisture condition; ball bearings, except sleeve bearings and small timing motors; windings impregnated to resist moisture; horsepower and duty-cycle ratings as required for the service indicated.
    - d. Power Characteristics: Refer to Division 16 specifications for project power characteristics. Also, refer to individual equipment requirements for loads and ratings.

## 2.3 FABRICATION OF METALWORK

- A. General Fabrication Requirements:
1. Remove burrs from sheared edges of metalwork, ease the corners and smooth to eliminate cutting hazard. Bend sheets of metal at not less than the minimum radius required avoiding grain-separation in the metal. Maintain flat, smooth surfaces without damage to finish. Reinforce metal at locations of hardware, anchorage and accessory attachments, wherever metal is less than 14 gage or requires mortise application. Conceal reinforcements to the greatest extent possible. Weld in place on concealed faces.
  2. Where fasteners are permitted, provide Phillips head, flat or oval head machine screws. Cap threads with acorn nuts unless fully concealed in inaccessible construction, and provide nuts and lock washers unless metal for tapping is at least 12 gauge. Match fastener head finish with finish of metal fastened.
  3. Provide removable panels for access to mechanical and electrical service connections that are concealed behind or within foodservice equipment, but only where access is not possible and not indicated through other work.

- B. Metal and Gauges:
1. Except as otherwise indicated, fabricate exposed metalwork of stainless steel; fabricate the following components from the gauge of metal indicated, and other components from not less than 20-gauge metal:
    - a. Table tops, Counter tops, Sinks, Drain-boards: 14 Gauge.
    - b. Shelves: 16 gauge, 18 gauge if less than 12" wide.
    - c. Front Drawer/Door Panels: 18 gauge (double-pan type).
    - d. Single-Pan Doors and Drawer Fronts: 16 gauge
    - e. Enclosed Base Cabinets: 18 gauge
    - f. Enclosed Wall Cabinets: 18 gauge
    - g. Exhaust Hoods: 18 gauge
    - h. Pan Type Inserts and Trays: 16 gauge
    - i. Skirts and Enclosure Panels: 18 gauge
    - j. Closure and Trim strips over 4" wide: 18 gauge
    - k. Hardware Reinforcement: 12 gauge
    - l. Gusset Plates: 10 gauge
- C. Work-Surface Fabrication:
1. Fabricate metal work surfaces by forming and welding to provide seamless construction, using welding rods matching sheet metal, grinding and polishing. Where necessary for disassembly, provide waterproof gaskets draw-type joints with concealed bolting.
  2. Reinforce work-surfaces 30" o.c. both ways with galvanized or stainless concealed structural members, reinforce edges which are not self-reinforced by formed edges.
  3. Sound deaden underside of metal work-surfaces, including sinks and similar units, with a coating of sound deadening material. Hold coating back 3" from sanitary edges that are open for cleaning.
- D. Structural Framing:
1. Except as otherwise indicated, provide framing of minimum 1"-pipe-size round pipe or tube members, with mitered and welded joints and gusset plates, ground smooth. Provide 14 gauge stainless steel tube joints for exposed framing and galvanized steel pips for concealed framing.
  2. Where indicated, flange rear and end edges up to form splashes integrally with top, with vertical and horizontal corners coved on not less than ¼" radius, die formed. Turn back splashes 1" to wall across top and ends with rounded edge on break unless otherwise specified.
  3. For die-crimped edges, use inverted "V" ½" deep inside and 2" deep on outside, unless otherwise shown. For straight down flanges, make 1 ¾" deep on outside. For bull nose edges, roll down 1 ¾".
    - a. Edges: die-formed, integral with top. For rounded corners, form to 1" radius, weld, and polish to original finish.
- E. Field Joints:
1. For any field joint required because of size of fixture, butt-joint, reinforce on underside with angles of same material, bolt together with non-corrosive bolts and nuts, field weld, grind and polish.
- F. Pipe Bases:
1. Construct pipe bases of 1-5/8" diameter 18 gauge stainless steel tubing. Fit legs with polished stainless steel sanitary adjustable bullet feet to provide for adjustment of approximately 1 ½" without exposing threads.
  2. Space legs to provide ample support for tops, preclude any possibility of buckling or sagging and in no case more than 6'-0" centers.

- G. Shelves:
1. Construct solid shelves under pipe base tables of 16 gauge stainless steel, with 1 ½" turned down and under edges, and 2" turn up at rear, against walls, welded to pipe legs.
- H. Sinks:
1. Construct sinks of 14 gauge stainless steel No. 4 finish inside and outside. Form back, bottom, front, of one piece with ends, partitions, welded into place.
  2. Partitions: double thickness, 1" minimum space between walls.
  3. Cove interior vertical and horizontal corners of each tub not less than ¼" radius, die formed. Outside ends of drain boards to have roll rim risers not less than 2 ½" high.
  4. Drill faucet holes in splashes 2 ½" below top edge on 8" centers.
  5. Weld sinks set into drain boards by 1 ½" x 14 gauge stainless steel angle brackets, securely welded to sinks and galvanized cross angles spot welded to underside of drain boards.
  6. Sink Drains: Install in center of bottom of each sink bowl 1 ½" I.P.S. quick opening pop-up lever type drain approximately 4" high, with a 4 ½" flange with lugs, and fit with 3-1/8" stainless steel strainer plate.
  7. Lever Handle: Of sufficient length to extend to front of sink, threaded at one end and fitted with tension spring. No riveting, screws or soldering permitted to fit drains to sinks, with all parts of drains easily removable for servicing and replacement.
  8. Slope bottom of sink bowls toward outlet. Include chrome-plated tailpiece and trap.
- I. Workmanship:
1. Best quality in the trade. Field verify dimensions, check measurements before fabricating; conform all items to dimensions of building; neatly fit around pipes, offsets and other obstructions.
  2. Fabricate only in accordance with approved shop drawings, showing all pipes, obstructions to be built around, and location of Utility Requirements and services.
  3. After the General Contractor has approved Shop Drawings, he is responsible for preventing additional obstructions being placed in way of kitchen equipment.
  4. Where equipment is exposed to customer view, provide enclosure of service lines, operating components and mechanical and electrical devices.
- J. Enclosures:
1. Provide enclosures, including panels, housings and skirts for service lines, operating components and mechanical and electrical devices associated with the Food Service Equipment, except as specifically indicated to be "open".
- K. Casework:
1. At fabricator's option, and unless otherwise indicated, provide either box-type face framing or open-channel-type (complying with NSF requirements in either case).
    - a. Enclosure: Except as otherwise indicated, provide each unit of casework (base, wall, overhead and free-standing) with a complete enclosure metal cabinet, including fronts, backs, tops, bottoms, and sides.
    - b. Door and Drawer Fronts: Except where single-pan construction is indicated, provide double-pan type, not less than 5/8" thick, with seams on inside face. Weld hardware reinforcement inside of inner pan. Sound deaden by either coating both pans on concealed face, or inserting mineral wool insulation between pans.

- c. Shelves: Except as otherwise indicated, provide adjustable standards for positioning and support of shelves in casework. Turn back-edge of shelf unit up 2" and hem. Turn other edges down to form open channel. Reinforce shelf units to support 40 lbs. per sq. ft. loading, plus 100% impact loading.
- d. Drawer Bodies: Except as otherwise indicated, draw-form drawer bodies from a single piece of metal to provide seamless construction. Flange top edge to protect slides from spillage.
- e. Closed Base: Where casework is indicated to be located on a raised-floor base, prepare casework for support without legs, and for anchorage and sealant application, as required for a completely enclosed and concealed base.
- f. Support from Floor: Equip floor-supported mobile units with casters and equip items indicated as "roll-out" units with manufacturer's standard one-directional rollers. Otherwise, and except for closed-base units, provide pipe or tube legs, with adjustable bullet-design feet for floor-supported items of fabricated metalwork. Provide 1 ½" adjustment of feet (concealed threading).

L. Exhaust Hood Fabrication:

- 1. Comply with NFPA -96, including Appendix A.
- 2. Grease Removal: Provide type indicated (removable filters if not otherwise indicated), with drip-channel gutters, drains and collection basing.
- 3. Light Fixtures: Fluorescent fixtures, UL listed for hoods with sealed safety lenses flush with inside of hood; stainless steel conduit for wiring/or UL listed for hoods, incandescent fixtures with sealed safety lenses surface mount.
- 4. Exhaust Duct: Galvanized steel, except stainless steel where exposed to view inside the building.
- 5. Exhaust Fan: Manufacturer's standard type (complying with section 5 of NFPA-96) (see also Mech. Section).

M. Fire Extinguishing System:

- 1. Material: System is to utilize a Wet Chemical system complying with NFPA No. 17 and 96.
- 2. The bidder is responsible to submit the necessary shop drawings and submittals required by the local authorities for a review of the Fire and Life Safety requirements of the specified system(s).
- 3. Shop Drawings: The Fire Suppression System Contractor is to submit shop drawings for the fire suppression system that are to include:
  - a. The name of the Owner/Occupant.
  - b. Site address and compass orientation indication.
  - c. Installing Fire Suppression Contractor's name, address and telephone number.
  - d. Graphic representation of scale for the drawings.
  - e. Hazard analysis with sufficient detail and dimensions to evaluate the hazard. Details are to include materials involved, location and arrangement and exposure to the hazard, combustibles, air handling equipment and heat sources.
  - f. Information and calculations on the amount of suppression agent to be used.
  - g. Indicate the size, length and arrangement of connected piping or piping and hose, including all fittings.
  - h. Indicate the description and location of nozzles to be used including flow rates of nozzles for engineered systems.
  - i. Indicate with details to identify apparatus and devices to be used.
  - j. Indicate location of all alarm-initiating and alarm-signaling devices.

- k. Indicate location and function of operating devices, auxiliary equipment and electrical circuitry if used.
  - l. Show location of annunciation panel.
  - m. Show location of power connection for fire extinguishing system as applicable including breaker number(s).
  - n. Show location of gas connection and shut off as applicable.
  - o. Identify type and location of manual activating device to operate the fire extinguishing system.
- 4. Certificate of Compliance: The Fire Suppression System Contractor must provide at the completion of the project, certification that the system has been installed in accordance with the approved plans and the manufacturer's listed installation and maintenance manual.
  - 5. Operation Instructions and As-Built Drawings: The Fire Suppression System Contractor must provide at the completion of the project, one set of manufacturer's listed installation and maintenance manuals or listed owner's manual that describes the system's operation, required maintenance and recharging to the Owner.
  - 6. System Alterations: When field conditions necessitate any substantial changes from the approved plans, the corrected As-Installed plans are to be prepared and submitted.
  - 7. Equipment List: Provide a complete equipment list for approval and before the installation of the fire alarm system identifying:
    - a. Type and model of fire extinguishing devices.
    - b. Manufacturer of fire extinguishing devices.
    - c. Manufacturer catalog data sheets for fire extinguishing devices.
    - d. Listing and capability of all equipment with the fire extinguishing system.
- N. Shop Painting:
- 1. Clean and prepare metal surfaces to be painted; remove rust and dirt, apply treatment to zinc-coated surface that has not been mill-phosphatized. Coat welded and abraded areas of zinc-coated surfaces with galvanized repair paint. Apply 1.5 mil (dry film thickness) metal primer coating, followed by 2, 1.0 mil (dry film thickness) metal, enamel finish coatings. Bake primer and finish coatings in accordance with paint manufacturer's instructions for a baked enamel finish.

## 2.4 REFRIGERATION EQUIPMENT

- A. Provide either single or multiple compressor units, as recommended by the manufacturer for the sizes and variations between connected evaporator loads as indicated.
- B. Provide units of the capacities indicated, arranged to respond to multiple-evaporator thermostats and defrosting timers. Include coils, receivers, compressors, motors, motor starters, mounting bases, vibrations insulation units, fans, dryers, valves, piping, insulation, gauges, winter control equipment, high ambient control equipment, and complete automatic control system.
- C. Refrigerant: Pre-charge units with type or types recommended by manufacturer for services indicated, with quick disconnect type connections where specified, ready to receive refrigerant piping runs to evaporators and (where remote) to condensers.
- D. Provide air-cooled condensers, located with the compressors, complete with refrigerant piping installed at the factory. Locate exterior units as shown with weather housings and protective enclosures.

- E. The minimum outdoor operating ambient temperature for design of units is -10 degrees F. Maximum ambient condition for load on the air cooled condenser is 95 degrees F. with 75% relative humidity in basically still air, or units to be provided with high ambient temperature controls.

## **2.5 CARBON DIOXIDE (CO2) EQUIPMENT**

- A. Where equipment requires connection with compressor CO2 cylinder for operation, provide 2-cylinders manifold and control system (integral with equipment) with proper connectors for Department of Transportation's (DOT) approved type cylinders, and complete with cylinder safety devices and supports. Comply with ANSA B57.1 "Compressed Gas Cylinder Valve Outlet and Inlet Connections", and comply with applicable standards of the Compressed Gas Association.

## **2.6 MISCELLANEOUS MATERIALS AND FABRICATION**

- A. Nameplate:
  - 1. Wherever possible, locate nameplates and labels on manufactured items in accessible position, but not within customer's normal view. Do not apply nameplates or labels on custom-fabricated work, except as required for compliance with governing regulations, insurance requirements or operator performance.
- B. Manufactured Equipment Items:
  - 1. Furnish items as scheduled or herein specified. Verify dimensions, spaces, rough in and service requirements and electrical characteristics before ordering. Provide all trim, accessories, and miscellaneous items for complete installation.

## **PART 3 - EXECUTION**

### **3.1 INSPECTION AND PREPARATION**

- A. The installer of the Food Service Equipment must examine the rough in of mechanical and electrical services by others, and the conditions under which the work is to be done and must verify dimensions of the services and substrates before fabricating the work. Notification of unsatisfactory conditions for the proper installation of the Food Service Equipment must be made in writing to the General Contractor.
- B. Do not proceed with the fabrication and installation until unsatisfactory dimensions and conditions have been corrected in a manner acceptable to the installer.
- C. Bidder is to verify site conditions to allow for the physical installation of each piece of equipment. Any consideration or associated cost required allowing for the installation is to be the responsibility of the bidder.

### **3.2 INSTALLATION**

- A. Water Connections: Install water connections and outlets at each item of equipment, with air gaps, vacuum breakers and similar provisions to comply with governing regulations, but not less than compliance with ANSI Standards A40.4 and A40.6.
- B. Gas burners: Install gas burning appliances, including gas vents if necessary, to comply with NFPA No. 54.

- C. Electrical Work: Assemble electrical components of equipment in accordance with applicable "Standards of Installation" by the National Electrical Contractors Association.
- D. Service Line and Equipment Connections: Refer to division 15 sections for piping connections and piping systems. Refer to division 16 sections for electrical work including equipment connections.
- E. Jointing and Anchoring:
  1. Set each items of non-mobile and non-portable equipment securely in place and level and adjust to correct height. Anchor to supporting substrate where indicated and where required for sustained operation and use without shifting or dislocation. Conceal anchorage wherever possible. Adjust counter tops and other work surfaces to a level tolerance of 1/8" (maximum offset, and plus-or-minus on dimensions, and maximum variation in 2'-0" run from level of indicated slope).
  2. Complete field assemble joints in the work (joints which cannot be completed in the shop) by welding, bolting and gaskets, or similar methods as indicated. Grind welds smooth and restore finish. Set or trim flush, except for "T" gaskets as indicated.
  3. Treat enclosed spaces (inaccessible after equipment installation) by covering horizontal surfaces with powdered borax at a rate of 4 oz. per sq. ft..
  4. Install closure plates and strips where required, with joints coordinated with units of equipment.
  5. Install sealant and gaskets all around each unit to make joints air tight, waterproof, vermin-proof, and sanitary for cleaning purposes.
  6. In general, make sealed joints not less than 1/8" wide, and stuff with backer rod to shape sealant bead properly, at 1/4" depth.
  7. Shape exposed surfaces of sealant slightly concave, with edges flush with faces of material joint.
  8. At internal-corner joints, apply sealant or gasket to form a sanitary cove, of not less than 3/8" radius.
  9. Provide sealant-filled or gasket joints up to 3/8" joint width; metal closure strips for wider joints, with sealant application each side of strips. Anchor gaskets mechanically or with adhesives to prevent displacement.

### **3.3 CLEANING:**

- A. After completion of installation, and completion of other major work in Food Service areas, remove protective coverings, if any, and clean Food Service Equipment, internally and externally.
- B. Restore exposed and semi-exposed finishes to remove abrasions and other damages; polish exposed-metal surfaces; touch-up painted surfaces. Replace work that cannot be successfully restored.
- C. Remove and dispose off site any and all crating and packaging material.

### **3.4 TESTING AND START-UP:**

- A. Delay the start-up of equipment until service lines have been tested, balanced, and adjusted for pressure, voltage and similar consideration; and until water and steam lines have been cleaned and treated for sanitation.



- B. Test each item of operational equipment to demonstrate that it is operating properly, and that controls and safety devices are functioning. Repair or replace equipment that is found to be defective in its operation, including units that are below capacity or operating with excessive noise or vibration.
- C. Final Cleaning: After testing and start-up, clean and sanitize the Food Service Equipment, and leave in a condition ready for use in food service.

**3.5 INSTRUCTIONS AND TRAINING:**

- A. Instruct the owner and any and all representatives of the owner in the proper operation and maintenance of each piece of operational equipment.

**3.6 WARRANTY:**

- A. Each item is to include a parts and labor warranty of no less than one year, and longer as standard to the manufacturer's warranty.

**3.7 INSTALLATION SCHEDULE:**

- A. Bidder is to review the projected construction schedule with the General Contractor prior to bidding and be able to accomplish the installation of the Food Service Equipment within the requirements of the project schedule.

**3.8 BIDDING FORMAT:**

- A. Bidder will provide a completed bid form for each section of work being bid, as per the General Conditions of this specification.
- B. The successful bidder will be required to submit an itemized list with individual costs for each piece of equipment included in the bid. Freight is to be included in the itemized cost for each item. Installation costs are to be itemized separately. A total amount is to be listed that includes all costs to complete the work.
- C. Change orders requested by the owner or required by job conditions to add to the equipment requirements are to be on a 'cost plus' basis. Bidder is to submit a proposal for a percentage amount that will be applied to equipment costs for all change orders.
- D. Change orders to delete equipment items will be directly related to the itemized costs breakdown provided.

**3.9 DISCREPANCIES:**

- A. Any discrepancies or errors located or identified in or between the specifications and plans are to be brought to the attention of the designer in writing prior to, or with the bid submittal. Any such item not identified which would cause the bid to increase, will be the responsibility of the bidder to correct.

### 3.10 ACCEPTABLE SUBSTITUTE MANUFACTURERS:

- A. The items listed are to be bid as specified. Manufacturers requesting to be approved as an equal substitute are to submit their request in writing to the Food Service Consultant for consideration at least (7) days prior to the bid date. Manufacturers will be considered approved and will be accepted as part of the bid only after being stated as such in writing in the form of an addendum and will be accepted only if they equally meet the specifications and standards of the specified manufacturer. A list of approved substitute manufacturers is to be submitted with the successful bidders itemized equipment list.
- B. The bidder is solely responsible to insure that the requirements of any alternate or approved equal manufacturer's piece of equipment provided by them, comply with the design intent of these documents including physical size, utility requirements and function.

### 3.11 EXCLUSIONS:

- A. The Owner reserves the right to exclude any and all items from the final contract.

## PART 4 - ITEMIZED LIST OF EQUIPMENT

|                            |  |
|----------------------------|--|
| ITEM #K-01                 | DRY STORAGE SHELVING   |
| Quantity:                  | (1) lot  |
| Manufacturer:              | Inter Metro  |
| Model Number:              | Super Erecta, Brite  |
| Dimensions:                | (7) 72"W x 24"D x 86"H<br>(1) 48"W x 24"D x 86"H<br>(2) 42"W x 24"D x 86"H<br>(1) 36"W x 24"D x 86"H   |
| Utility Requirements:      | None   |
| Accessories:               | A) Lot to include: (35) #2460BR shelves<br>(5) #2448BR shelves<br>(10) #2442BR shelves<br>(5) #2436BR shelves<br>(24) #86PBR posts<br>(110) #9995Z 'S' clips |
| Installation Instructions: | A) Assemble, set and level as per plan. (Verify actual field dimensions for compliance.)   |
| ITEM #K-02                 | STORAGE DUNNAGE RACK   |
| Quantity:                  | (1) lot  |
| Manufacturer:              | InterMetro, Chrome   |
| Model Number:              | Super Erecta, #MHP55C  |
| Dimensions:                | 48"W x 24"D x 14 1/2"H   |
| Utility Requirements:      | None   |
| Accessories:               | A) Wire Mat.<br>B) Set of heavy-duty casters.<br>C) Stainless steel finish.<br>D) Lot to include (3) units.  |
| Installation Instructions: | A) Assemble and set in place as per plan.  |

ITEM #K-03

WALK-IN COOLER/FREEZER BOX

- Quantity: (1) lot  
Manufacturer: Kolpack  
Model Number: #NS (Nominal Size/Custom)  
Dimensions: Cooler: 9'-7 1/2"W x 15'-5"D x 8'-6"H, as per plan  
Freezer: 9'-7 1/2"W x 15'-5"D x 8'-6"H, as per plan
- Utility Requirements: A) 115/60/1, 2.29 amps at freezer door. Interconnect with (4) LED lights.  
B) 115/60/1, 1.76 amps at cooler door. Interconnect with (4) LED lights.
- Accessories: A) Provide (2) each 36" stainless steel door units with view window.  
B) Provide (6) additional LED vapor proof lights for a total of (4) lights at freezer box and (4) lights in cooler box.  
C) Provide vacuum relief heated air vent at each door.  
D) Provide stainless steel side trim to walls.  
E) Common center wall between cooler and freezer.  
F) Provide additional door hinge to each door.  
G) Stainless steel finish on exposed exterior surface of box. Galvalume finish on all other exterior surfaces of box.  
H) White galvalume finish on interior exposed surface of box.  
I) Provide 'Thermo Curtain' at each door.  
J) Provide a temperature sensor capable of being connected to a communications data port.
- Installation Instructions: A) Assemble and set in place as per plans to sub floor with PVC floor screens.  
B) General Contractor to provide floor tile and base.  
C) Tile floor with base to be applied after box installation. Door height to compensate for floor tile dimension.  
D) General Contractor to provide insulated floor system at freezer as per plans and details.

ITEM #K-04A

FREEZER REFRIGERATION SYSTEM: CONDENSER

- Quantity: (1) system  
Manufacturer: Kolpak  
Model Number: #KPC299LZOP-3P  
Dimensions: 33"W x 41"D x 23"H
- Utility Requirements: A) 208/60/3, 12.3 amps, 3 H.P. (To be connected to emergency generator)  
B) Interconnect refrigeration lines with item #K-4B
- Accessories: A) Include: Pre piped Tecumseh hermetic compressors with dryers, sight glasses and head pressure controls; pre-wired electrical panel, defrost clock, pressure controls and crankcase heaters. (Verify all requirements with manufacturer).  
B) Interconnect with blower coils #K-4B.  
C) Verify location of unit in mechanical room above.  
D) Provide with low ambient temperature kit.  
E) Provide with mounting skids.  
F) Size to maintain -10°F in box as per plan.
- Installation Instructions: A) Mount in mechanical room above as per manufacturers shop drawings.  
B) Interconnect refrigeration lines with blower coil, item #K-4B.  
C) Set refrigeration equipment on mounting skids, provide and install expansion coils, T-Stat, solenoid valves.  
D) Provide and install refrigeration piping, insulation, fittings, hangers, supports and hook-ups.

- E) Charge each system with the refrigerant as specified by the manufacturer.
- F) Check, test, start up and final adjustments are to be provided.
- G) K.E.C. to provide heat trace and insulation at drain line in freezer.
- H) General Contractor to provide floor and wall penetrations to mechanical room installation location and penetration sealing at refrigeration lines.
- I) Electrical Contractor to interconnect refrigeration system as required.
- J) Electrical Contractor to provide defrost electrical inter-connect to freezer units.

**ITEM #K-04B**

**FREEZER REFRIGERATION SYSTEM: BLOWER COIL**

- Quantity: (1) system  
 Manufacturer: Kolpak  
 Model Number: #KEL26-105-2EC-PR-4  
 Dimensions: 44"W x 16"D x 17"H  
 Utility Requirements: A) Fan: 208/60/1, 1 amp. (To be connected to emergency generator)  
 Heater: 208/60/1, 9.8 amps. (To be connected to emergency generator)  
 B) 3/4" Indirect drains to floor sink.  
 C) Interconnect refrigeration lines with item #K-4A
- Accessories: A) Interconnect with condenser Item #K-4A.  
 B) Mounting Hardware.  
 C) Size to maintain -10°F in box as per plan.  
 D) Provide a temperature sensor capable of being connected to a communications data port.
- Installation Instructions: A) Mount from walk-in ceiling.  
 B) Interconnect with Refrigeration Condenser, #K-4A as part of pre-assembled remote system.  
 C) Plumbing Contractor to provide and install drain lines from blower coils in boxes.  
 D) Electrical Contractor to interconnect refrigeration system as required including defrost cycle.

**ITEM #K-05A**

**COOLER REFRIGERATION SYSTEM: CONDENSER**

- Quantity: (1) system  
 Manufacturer: Kolpak  
 Model Number: #KPC99MZOP-3P  
 Dimensions: 33"W x 26"D x 19"H  
 Utility Requirements: A) 208/60/3, 9.4 amps, 1 H.P. (To be connected to emergency generator)  
 B) Interconnect refrigeration lines with item #K-5B
- Accessories: A) Include: Pre piped Tecumseh hermetic compressors with dryers, sight glasses and head pressure controls; pre-wired electrical panel, defrost clock, pressure controls and crankcase heaters. (Verify all requirements with manufacturer).  
 B) Interconnect with evaporator item #K-5B.  
 C) Verify location of unit in mechanical room above.  
 D) Provide with low ambient temperature kit.  
 E) Provide with mounting skids.  
 F) Size to maintain +35°F in box as per plan.
- Installation Instructions: A) Mount in mechanical room above as per manufacturers shop drawings.

- B) Interconnect refrigeration lines with Blower Coil, item #K-5B.
- C) Set refrigeration equipment on mounting skids, provide and install expansion coils, T-Stat, solenoid valves.
- D) Provide and install refrigeration piping, insulation, fittings, hangers, supports and hook-ups.
- E) Charge each system with the refrigerant as specified by the manufacturer.
- F) Check, test, start up and final adjustments are to be provided.
- G) General Contractor to provide floor and wall penetrations to mechanical room installation location and penetration sealing at refrigeration lines.
- H) Electrical Contractor to interconnect refrigeration system as required.

**ITEM #K-05B**

**COOLER REFRIGERATION SYSTEM: BLOWER COIL**

- Quantity: (1) system  
 Manufacturer: Kolpak  
 Model Number: #KAM26-117-1EC-PR-4  
 Dimensions: 42"W x 15"D x 15"H  
 Utility Requirements: A) 115/60/1, 1.6 amps. (To be connected to emergency generator)  
 B) 3/4" Indirect drains to floor sink.  
 C) Interconnect refrigeration lines with item #K-5A.  
 Accessories: A) Mounting hardware.  
 B) Size to maintain +35°F in box as per plan.  
 C) Provide a temperature sensor capable of being connected to a communications data port.  
 Installation Instructions: A) Mount from Walk-In Box ceiling.  
 B) Interconnect with Refrigeration Condenser Item #K-5A.  
 C) Plumbing Contractor to provide and install drain lines from blower coils in box.

**ITEM #K-06**

**WALK-IN BOX SHELVING**

- Quantity: (1) lot  
 Manufacturer: Inter Metro  
 Model Number: Super Erecta, Metro Seal III  
 Dimensions: (2) 72"W x 24"D x 74"H  
 (4) 60"W x 24"D x 74"H  
 (2) 54"W x 24"D x 74"H  
 Utility Requirements: None  
 Accessories: A) Lot to include: (8) #2472NK3 shelves  
 (16) #2460NK3 shelves  
 (8) #2454NK3 shelves  
 (24) #86PK3 posts  
 (32) #9995Z 'S' clips  
 Installation Instructions: A) Assemble, set and level as per plan. (Verify actual field dimensions for compliance.)

ITEM #K-07 WALK-IN DUNNAGE RACK

Quantity: (1) lot  
Manufacturer: InterMetro, Stainless Steel  
Model #: Super Erecta, #MHP55S  
Dimensions: (4) 48"W x 24"D x 14-1/2"H  
Utility Requirements: None  
Accessories: A) Wire Mat.  
B) Set of heavy-duty casters.  
C) Stainless steel finish.

Installation Instructions: A) Assemble and set in place as per plan.

ITEM #K-08 SPEED RACK: MOBILE

Quantity: (12) each  
Manufacturer: New Age  
Model Number: #95864  
Dimensions: 21"W x 26"D x 63"H  
Utility Requirements: None  
Accessories: A) Perimeter bumpers.  
B) (18) 18" x 26" pan capacity.  
C) Set of heavy-duty locking casters.  
D) Sized to fit in Roll-Through refrigerator and food warming cabinet.

Installation Instructions: A) Assemble and set in place as per plan.

ITEM #K-09 ICE MAKER and BIN

Quantity: (1) each  
Manufacturer: Manitowoc  
Model Number: #IY-0504A  
Dimensions: 30"W x 25"D x 27"H (34"D x 72"H with Bin)  
Utility Requirements: A) 3/8" cold water.  
B) 1/2" indirect drain to floor sink. (Ice Maker).  
C) 1/2" indirect drain to floor sink. (Ice Maker).  
D) 3/4" Indirect drain to floor sink. (Bin).  
E) 115/60/1, 14.2 amp.

Accessories: A) Stainless steel finish.  
B) 570 lb. ice production capacity per 24 hours.  
C) Provide filter for incoming water.  
D) Self-contained, air cooled unit.  
E) Provide ice bin #B-570. 430 lb capacity.

Installation Instructions: A) Water pressure to be 20 to 80 psi.  
B) Mount to Bin as per plan.

ITEM #K-10 SPARE NUMBER



ITEM #K-15 STAINLESS STEEL WALL SHELF

Quantity: (1) each  
Manufacturer: Custom Metal Fabricated  
Model Number: Custom, as per plans and details.  
Dimensions: 9'-0"W x 1'-2"D.  
Utility Requirements: None  
Accessories: A) Provide with (3) mounting brackets.  
Installation Instructions: A) Mount to wall at +62" A.F.F. as per plan. (Verify clearance to pre-rinse spay, item #K-14, below)  
B) General Contractor to provide blocking in wall as required.

ITEM #K-16 STAINLESS STEEL WALL FLASHING

Quantity: (1) each  
Manufacturer: Custom Metal Fabricated  
Model Number: Custom, as per plans and details.  
Dimensions: 9'-0"W as per plan from base to ceiling (approximately 10'-0"H).  
Verify with field measurements.  
Utility Requirements: None  
Accessories: A) Provide 20 gauge stainless steel wall flashing from base to ceiling a.f.f., from across full width of Prep Sink, as per plan.  
Installation Instructions: A) Securely mount to wall with high temperature construction adhesive. Seal all penetrations.

ITEM #K-17 STAINLESS STEEL WORK TABLE

Quantity: (1) each  
Manufacturer: Custom Fabricated  
Model Number: Custom  
Dimensions: 7'-0"W x 2'-6"D x 36"H  
Utility Requirements: None.  
Accessories: A) 8" back splash.  
B) Stainless steel under shelf.  
C) (2) 20" x 20" Drawers mounted at each side.  
Installation Instructions: A) Set and level as per plan.  
B) Clip and seal back splash to wall.

ITEM #K-18 STAINLESS STEEL WALL SHELF

Quantity: (1) each  
Manufacturer: Custom Metal Fabricated  
Model Number: Custom, as per plans and details.  
Dimensions: 7'-0"W x 1'-2"D.  
Utility Requirements: None  
Accessories: A) Provide with (2) mounting brackets.  
Installation Instructions: A) Mount to wall at +62" A.F.F. as per plan. (Verify clearance to slicer, item #K-28 below)  
B) General Contractor to provide blocking in wall as required.



ITEM #K-19 STAINLESS STEEL WORK TABLE

Quantity: (1) each  
Manufacturer: Custom Fabricated  
Model Number: Custom  
Dimensions: 5'-0"W x 2'-6"D x 36"H  
Utility Requirements: None.  
Accessories: A) 8" back splash.  
B) Stainless steel under shelf.  
C) (2) 20" x 20" Drawers mounted at each side.

Installation Instructions: A) Set and level as per plan.  
B) Clip and seal back splash to wall.

ITEM #K-20 SPARE NUMBER

ITEM #K-21 STAINLESS STEEL WALL SHELF

Quantity: (1) each  
Manufacturer: Custom Metal Fabricated  
Model Number: Custom, as per plans and details.  
Dimensions: 5'-0"W x 1'-2"D.  
Utility Requirements: None  
Accessories: A) Provide with (2) mounting brackets.  
Installation Instructions: A) Mount to wall at +62" A.F.F. as per plan.  
B) General Contractor to provide blocking in wall as required.

ITEM #K-22 MICROWAVE OVEN

Quantity: (1) each  
Manufacturer: Amana  
Model Number: #HDC12A2  
Dimensions: 17"W x 22"D x 14"H  
Utilities: A) 120/60/1, 16.8 amps.  
Accessories: A) Standard features.  
Installation Notes: A) Set in place as per plan.

ITEM #K-23 STAINLESS STEEL WORK TABLE

Quantity: (1) each  
Manufacturer: Custom Fabricated  
Model Number: Custom  
Dimensions: 10'-0"W x 2'-6"D x 36"H  
Utility Requirements: None.  
Accessories: A) 8" back splash.  
B) Stainless steel under shelf.  
C) (4) 20" x 20" Drawers mounted at each side and in center.

Installation Instructions: A) Set and level as per plan.  
B) Clip and seal back splash to wall.

|                            |  |
|----------------------------|--|
| ITEM #K-24                 | STAINLESS STEEL WALL SHELF   |
| Quantity:                  | (1) each   |
| Manufacturer:              | Custom Metal Fabricated  |
| Model Number:              | Custom, as per plans and details.  |
| Dimensions:                | 10'-0"W x 1'-2"D.  |
| Utility Requirements:      | None   |
| Accessories:               | A) Provide with (2) mounting brackets.   |
| Installation Instructions: | A) Mount to wall at +62" A.F.F. as per plan.<br>B) General Contractor to provide blocking in wall as required.   |
| ITEM #K-25                 | SPARE NUMBER   |
| ITEM #K-26                 | 30 QUART MIXER   |
| Quantity:                  | (1) each   |
| Manufacturer:              | Hobart   |
| Model #:                   | #HL300   |
| Dimensions:                | 23"W x 30"D x 50" H  |
| Utilities:                 | A) 120/60/1, 9.5 amp.  |
| Accessories:               | A) Standard Accessory Package  |
| Installation Instructions: | A) Set and level as per plan.  |
| ITEM #K-27                 | HOT HOLDING/PROOFING CABINET   |
| Quantity:                  | (1) each   |
| Manufacturer:              | Winston  |
| Model Number:              | #HA4519  |
| Dimensions:                | 25"W x 34"D x 76"H   |
| Utility Requirements:      | A) 120/60/1, 19.1 amp.   |
| Accessories:               | A) Set of heavy-duty locking casters.<br>B) Viewing windows.<br>C) Dutch doors.<br>D) Hinged on right as per plan.   |
| Installation Instructions: | A) Set in place as per plan.<br>B) Cord & Plug utility connection to be to Utility Distribution System, item #K-34.  |
| ITEM #K-28                 | STAINLESS STEEL WORK TABLE   |
| Quantity:                  | (1) each   |
| Manufacturer:              | Custom Metal Fabricated  |
| Model Number:              | Custom, as per plans and details.  |
| Dimensions:                | 9'-0"W x 3'-0"D x 36"H   |
| Utility Requirements:      | None.  |
| Accessories:               | A) Stainless steel under shelf.<br>B) (2) 20" x 15" Drawers mounted to each side as per plan.<br>C) Provide with (2) duplex receptacles mounted to underside of table at end and pre-wired to junction box ready for field connection.<br>D) Anchor feet to floor to prevent movement. |
| Installation Instructions: | A) Set and level as per plan.  |

|                            |  |
|----------------------------|--|
| ITEM #K-29                 | STAINLESS STEEL UTENSIL RACK   |
| Quantity:                  | (1) each   |
| Manufacturer:              | Custom Metal Fabricated  |
| Model Number:              | Custom, as per plans and details.  |
| Dimensions:                | 6'-0"W x 2'-0"D  |
| Utility Requirements:      | None   |
| Accessories:               | <ul style="list-style-type: none"> <li>A) Triple 1-1/2" x 3/16" stainless steel bar type rack, table mounted with 1-5/8" O.D. stainless steel tubing supports extended through the tabletop below and anchored to the under shelf with concealed fasteners.</li> <li>B) Provide with (36) pot hooks.</li> </ul>  |
| Installation Instructions: | A) Mount to worktable, item #K-28 as per plan.   |
| ITEM #K-30                 | SPARE NUMBER   |
| ITEM #K-31                 | STAINLESS STEEL EXHAUST HOOD with MAKE UP AIR PLENUM:<br>TYPE I  |
| Quantity:                  | (2) each   |
| Manufacturer:              | Aqua-Matic   |
| Model #:                   | #AM-ND-2-PSP-F   |
| Dimensions:                | <ul style="list-style-type: none"> <li>(1) Section at 10'-0"W x 5'-0"D (6'-2" at MUA) x 2'-6"H</li> <li>(1) Section at 9'-0"W x 5'-0"D (6'-2" at MUA) x 2'-6"H (10'-0"W with Utility Cabinet)</li> </ul>   |
| Utilities:                 | <ul style="list-style-type: none"> <li>A) 120/60/1, 600 watt. Pre-wired to Utility Distribution System, item #K-33.</li> <li>B) Total exhaust for both hoods 4050 CFM at (1) duct collars at 14"D" each 1800 CFM each at 0.666" SP and 1684 duct velocity and (1) duct collars at 14"D" each 2250 CFM each at 1.013" SP and 2105 duct velocity.</li> <li>C) Total make-up air for both hoods 3240 CFM (3) duct collars at 12" x 24" each 480 CFM each at 0.128" SP and (3) duct collars at 12" x 24" each 600 CFM each at 0.162" SP.</li> </ul>  |
| Accessories:               | <ul style="list-style-type: none"> <li>A) Wall canopy type units mounted to Utility Distribution System, item #K-33, with 12" filler at space between hoods at top and from structure above. Provide hanger rods and seismic restraints.</li> <li>B) Hoods to be UL listed, #710, NFS Approved and built in compliance to the prevailing NFPA Standard #96.</li> <li>C) Captrate Solo filters with hooks.</li> <li>D) Integral 3" dead air space as required.</li> <li>E) Provide hanger rods and seismic restraints.</li> <li>F) Provide duct heat sensor assembly at each exhaust duct connections to comply with current code. Connect to control panel.</li> <li>G) (6) Recessed LED light fixtures.</li> <li>H) Stainless steel enclosure panels from hood to ceiling.</li> <li>I) Full-length concealed grease drip tray below the filters pitched to an enclosed metal grease container.</li> <li>J) Perforated front make-up air plenum at each hood.</li> <li>K) Provide duct heat sensor assembly at each exhaust duct connections and control box to comply with current code.</li> <li>L) Provide utility cabinet at left side of 9'-0"hood, as per plan for hood controls, duct heat sensor controls and fire protection system.</li> </ul> |
| Installation Notes:        | A) Mount from structure above as per plan. (1,551 lb.)   |

- B) Mechanical Contractor to connect exhaust and make-up air ducts to duct collars.
- C) Heat Sensor to be installed by K.E.C. and interconnected by the Electrical Contractor to the hood exhaust system as required to activate exhaust system when activated by heat.

**ITEM #K-32**

**FIRE PROTECTION SYSTEM**

- Quantity: (1) lot  
 Manufacturer: Ansul  
 Model Number: #R-102  
 Dimensions: -  
 Utility Requirements: -  
 Accessories: A) Provide gas shut off valve and five electrical shut off contacts as required for protected equipment, for installation by mechanical and electrical contractors.
- Installation Instructions: A) Provide a complete self-contained and certified system.  
 B) To protect Exhaust Hoods, items #K-31. Tanks to be located in utility cabinet at end of hood as per plan.  
 C) All conduits and piping to be concealed in walls and ceiling. Exposed piping in hood to be chrome.  
 D) Verify placement of emergency pull station with architect.

**ITEM #K-33**

**UTILITY DISTRIBUTION SYSTEM**

- Quantity: (1) system  
 Manufacturer: Captive-Aire  
 Model #: #UDI  
 Dimensions: 10'-0"W x 12"D x 6'-6"H at end risers  
 Utilities: A) Single point 120-208/60/3, 100 amp. (Electrical connection, to provide power for equipment under the hood including hood lights as per plan.)  
 B) Provide switch/controls for exhaust hood.  
 C) 1-1/4" natural gas loop connection, to provide gas for equipment under the hood. 1200 MBH with 704 MBH future capacity.  
 D) Single point 3/4" hot and cold water connection, to provide water to equipment under the hood. Hot is for future use.
- Accessories: A) 10'-0" x 12"D x 21"H 16 gauge stainless steel chase with factory supplied electrical wiring and plumbing as required by equipment in plan.  
 B) Floor mounted with riser to ceiling at each end for utility connections.  
 C) Electrical service is to be complete including main panel, interchangeable point of use circuit breaker, light switch for hood lights, switch for hood exhaust/make up air system and grounding type receptacles for each power point connection.  
 D) Hot and cold water lines are factory plumbed to individual connection with shut off valves, quick disconnects and NSF approved flexible hoses for each piece of equipment. 1-1/4" looped gas supply system, factory plumbed with individual shut off valves, quick disconnects and NSF/AGA approved flexible gas hoses for each piece of equipment.  
 E) Provide one gas solenoid valve factory mounted and wired, and electrical power shut off as required.  
 F) Provide with water filter installed in system with access door.
- Installation Notes: A) Set and level as per plan. Extend top through hoods to ceiling.

ITEM #K-34

STACKED CONVECTION OVEN: GAS

- Quantity: (2) each  
Manufacturer: Vulcan  
Model Number: #VC66GD  
Dimensions: 41"W x 42"D x 70"H (with Stand)  
Utility Requirements: A) 3/4" natural gas, 100,000 BTU/Hr.  
B) 115/60/1, 7.7 amp. (2) each per item  
Accessories: A) Solid state temperature controls  
B) Stainless steel finish including top and sides.  
C) Heavy duty locking casters, (2) with locks.  
D) Provide with cord and plugs.  
E) Dependent doors.  
F) 48" Quick disconnect flexible hose gas connection with wall tether.  
G) Provide leak limiter pressure regulator as required.  
H) Stacking kit.  
Installation Instructions: A) Set in place as per plan.  
B) Gas utility connection to be quick disconnect.  
C) Adjust for local altitude and environmental conditions as required.

ITEM #K-35

COMBI STEAMER/OVEN: GAS

- Quantity: (1) each  
Manufacturer: Rational  
Model Number: #iCombi Pro 10-full size G  
Dimensions: 42"W x 39" x 39"H (68"H with stand).  
Utility Requirements: A) 3/4" natural gas, 152,000 BTU/Hr.  
B) 208/60/1, 1500 watt.  
C) 3/4" cold water. Drinking quality only. (14.5) to (87) psi required. Consumes 3.17 GPM. Provide flexible connection to allow for movement of oven.  
D) 1" cold water direct connection to drain tempering device connected to drain after manifold connection.  
E) 2" indirect drain to floor sink.  
Accessories: A) HDC HiDensityControl  
B) ELC Efficient Level Control.  
C) CleanJet auto-clean, Care Control self clean.  
D) (10) 18" x 26" or (20) 12" x 20" pan capacity.  
E) Accessories including:  
a. (10) each 12" x 20" x 2-1/2" perforated gastronorm pans.  
b. (5) each 12" x 20" stainless steel grid shelves.  
c. (10) each 12" x 20" fry baskets.  
d. (4) each 12" x 20" Teflon perforated baking trays.  
e. (4) 12" x 20" non-stick coated pans.  
F) Rational Certified Installation.  
G) Rational Certified Chef training  
H) Installation Kit "10"  
I) Water filter to meet quality standards set above.  
J) 48" Quick disconnect flexible hose gas connection with wall tether.  
K) Provide leak limiter pressure regulator as required.  
L) Provide CDF #DTV-HV drain water tempering kit for installation at drain by plumbing contractor.  
Installation Instructions: A) Set in place on stand and level as per plan, set as far back under the hood as possible.

- B) Gas utility connection to be quick disconnect.
- C) Adjust for local altitude as required.
- D) Plumbing Contractor to provide water connections and copper drain connection.

**ITEM #K-36**

**STEAMER**

- Quantity: (1) each  
 Manufacturer: Cleveland  
 Model Number: #24-CGA-10.2ES  
 Dimensions: 24"W x 35"D x 69"H  
 Utility Requirements: A) (2) each 115/60/1, 150 watts.  
 B) 3/8" Cold water. 35 PSI Min. / 60 PSI Max. Generator  
 C) 1/2" Cold water. 35 PSI Min. / 60 PSI Max. Condenser  
 D) 2" Indirect drain to floor sink.  
 E) 1-1/4", Natural gas, 100,000 BTU/Hr.
- Accessories: A) Electrical cord and plug.  
 B) Left hand door hinging.  
 C) Claris or 3MCuno water filter system to provide proper water quality at Generator connection. Condenser to have Pre-filter water connection only.  
 D) 48" Quick disconnect flexible gas hose connector and fittings, with wall tether.  
 E) Provide leak limiter pressure regulator as required.  
 F) Provide drain water tempering kit for installation at drain by plumbing contractor.
- Installation Instructions: A) Set and level as per plans. Bolt to floor.  
 B) Water to be minimum requirements of: Total dissolved solids of no greater than 60 parts per million; pH no greater than 7.5; silica less than 13 parts per million; alkalinity less than 20 parts per million.  
 C) Quick disconnect utility connection.  
 D) Adjust for local altitude and environmental conditions as required.

**ITEM #K-37**

**FOUR BURNER INDUCTION RANGE: with STAINLESS STEEL CABINET BASE**

- Quantity: (1) each  
 Manufacturer: CookTek  
 Model Number: #MC14004-200  
 Dimensions: 25"W x 31"D x 16"H (with feet). Total height 36" with stand)  
 Utility Requirements: A) 208/60/3, 38.9 amp.
- Accessories: A) Stainless steel finish including top and sides.  
 B) Four induction burners.  
 C) Stainless steel cabinet base with casters. To have enclosed sides and back. Size to mount range top with total height of 20".
- Installation Instructions: A) Set in place as per plan.  
 B) Adjust for local altitude as required.

ITEM #K-38                                  ROLL-THROUGH HOT HOLDING CABINET

Quantity:                                  (2) each  
Manufacturer:                              Traulsen  
Model Number:                            #RIH132LP-FHS  
Dimensions:                                36"W x 40"D x 84"H  
Utility Requirements:                    A) 208/60/1, 7.8 amp.  
Accessories:                                A) Finished sides.  
    B) Door lock.  
    C) Stainless steel threshold ramp at both sides.  
    D) Swing doors as per plan.  
Installation Instructions:                A) Set in place as per plan.

ITEM #K-39                                  ROLL-THROUGH REFRIGERATOR

Quantity:                                  (2) each  
Manufacturer:                              Traulsen  
Model Number:                            #RRI132LPUT-FHS  
Dimensions:                                36"W x 40"D x 84"H  
Utility Requirements:                    A) 115/60/1, 11.6 amp.  
Accessories:                                A) Self-contained, air-cooled refrigeration.  
    B) Finished sides.  
    C) Door lock.  
    D) Stainless steel threshold ramp at both sides.  
    E) Swing doors as per plan.  
Installation Instructions:                A) Set in place as per plan.

ITEM #K-40                                  SPARE NUMBER

ITEM #K-41                                  STAINLESS STEEL UTILITY COUNTER: with UTILITY SINK

Quantity:                                  (1) each  
Manufacturer:                              Custom Fabricated  
Model Number:                            Custom  
Dimensions:                                5'-6"W x 32"D x 36"H  
Utility Requirements:                    A) 1/2" Hot and cold water.  
    B) 1-1/2" Indirect drain to floor sink.  
Accessories:                                A) 8" back and left side splash.  
    B) Stainless steel bottom and intermediate shelf.  
    C) Stainless steel apron mounted in front of utility sink.  
    D) Utility sink welded into top at center, with faucet and drain.  
    E) (2) Drawer mounted at each side.  
    F) Finished sides and cabinet base.  
Installation Instructions:                A) Set and level as per plan.  
    B) Clip and seal back splash to wall.

ITEM #K-42

STAINLESS STEEL WALL SHELF

Quantity: (1) each  
Manufacturer: Custom Metal Fabricated  
Model Number: Custom, as per plans and details.  
Dimensions: 5'-6"W x 1'-2"D.  
Utility Requirements: None  
Accessories: A) Provide with (2) mounting brackets.  
Installation Instructions: A) Mount to wall at +62" A.F.F. as per plan.  
B) General Contractor to provide blocking in wall as required.

ITEM #K-43

STAINLESS STEEL SERVICE COUNTER

Quantity: (1) each  
Manufacturer: Custom Metal Fabricated  
Model Number: Custom, as per plans and details.  
Dimensions: 26'-2"W x 3'-0"D x 36"H, 34"H at front tray slide (Verify with field measurements.)  
Utility Requirements: None  
B) 34"H x 10"D Stone top tray slide with inlayed stainless steel strips mounted on stainless steel top as per plan and detail.  
C) 36"H x 2'-2"D Stone top on solid stainless steel work surface as per details  
D) Unit includes:  
Install (2) Four Pan Hot/Cold/Frozen Pan, item #K-44 into unit as per plans and details.  
E) Provide apron and open bottom with vented stainless steel cabinet doors as per plan and details.  
F) Install controls in apron panel as per details.  
G) Stainless steel adjustable bullet feet on steel frame as per details.  
H) Removable stainless steel base plate attached to counter feet at back.  
I) Finished front low wall to be provided by General Contractor with matching end panel with plastic laminate on plywood panel attached to counter frame, as per architect's finish schedule.  
J) Stone selection as per architect's finish schedule.  
Installation Instructions: A) Set and level as per plan.  
B) Build in items #K-44, as per plan.  
C) Build on item #K-45, as per plan.

ITEM #K-44

HOT/COLD/FROZEN FOOD WELLS: FOUR SECTION

Quantity: (2) each  
Manufacturer: LTI  
Model Number: Quick Switch Slim Line #QSCHFP-4S-T  
Dimensions: 98"W x 17"D x 30"H  
Utilities: A) 3/4" indirect drain to floor sink.  
B) 120/60/1, 23.7 Amp.  
Accessories: A) Drain manifold with four quarter turn ball valve drains and one exit.  
B) Individual thermostat controls per pan.  
C) Wet or dry operation per compartment.  
D) Mount controls to back apron of Counter, item #K-43.  
E) Manual water fill to individual compartments.  
Installation Notes: A) Build into Service Counter, item #K-43, as per plan.



ITEM #K-45

FOOD GUARD SERVING SHELF

Quantity: (1) lot  
Manufacturer: BSI  
Model Number: #XG3500-2  
Dimensions: 25'-6"W x 14"D x 1'-11"H. Verify with field measurements.  
Utility Requirements: None  
Accessories: A) (6) 4'-3" a sections and seven supports with adjustable front food shields and top shelf in stainless steel finish at Serving Counter, item #K-43, as per plans and details. Verify finish with architect.  
B) Stainless steel under-counter heavy-duty flange supports mounted through counter top to base counter structure.  
C) 1" Radius corners, 3/8" Tempered Glass.  
Installation Instructions: A) Build onto Service Counters, item #K-43.

ITEM #K-46

KITCHEN SHELVING

Quantity: (1) lot  
Manufacturer: Inter Metro  
Model Number: Super Erecta, Brite  
Dimensions: (1) 60"W x 24"D x 86"H  
Utility Requirements: None  
Accessories: A) Lot to include: (5) #2460BR shelves  
(4) #86P posts  
Installation Instructions: A) Assemble, set and level as per plan. (Verify actual field dimensions for compliance.)

ITEM #K-47

MILK COOLERS: MOBILE

Quantity: (2) each  
Manufacturer: Traulsen  
Model #: #RMC34S4  
Dimensions: 34"W x 32"D x 46"H  
Utility Requirements: A) 115/60/1, 7.2 amp.  
Accessories: A) Provide with set of casters, two with brakes.  
B) Lid Locking device.  
C) Cord and plug.  
D) White exterior, stainless steel interior.  
E) Single sided access.  
Installation Instructions: A) Set in place as per plan.

ITEM #K-48

TRAY-SILVERWARE DISPENSER CART

Quantity: (2) each  
Manufacturer: Cambro  
Model Number: #TDCR12 (Verify tray size)  
Dimensions: 39"W x 23"D x 42"H  
Utility Requirements: None  
Accessories: A) Bottom cart with casters with locks.  
B) Cutlery rack top with (12) Nylon flatware cylinders.  
Installation Instructions: A) Set in place as per plan.

ITEM #K-49 STAINLESS STEEL CASHIER STAND: MOBILE

Quantity: (1) each  
Manufacturer: Custom Metal Fabricated  
Model Number: Custom, as per plans and details.  
Dimensions: 4'-0"W x 30"D x 30"H  
Utility Requirements: None  
Accessories: A) 30"H with 3" edge stone top with inlaid stainless steel strips mounted on stainless steel top as per plan and detail.  
B) Swivel casters with locks on steel frame as per details.  
C) Finished front and side panels with plastic laminate on plywood panel attached to counter frame, as per architect's finish schedule.  
D) Stone selection as per architect's finish schedule.  
E) Stainless steel interior base cabinet.  
B) Provide under shelf at back for CPU. Verify equipment requirements.  
C) Provide opening in back for cord management system.  
D) Provide grommet through top for computer cables and cords.  
Installation Instructions: A) Set in place as per plan.

ITEM #K-50 SPARE NUMBER

ITEM #K-51 DISHROOM SHELVING

Quantity: (1) lot  
Manufacturer: Inter Metro  
Model Number: Super Erecta Brite  
Dimensions: (7) 48"W x 24"D x 86"H  
Utility Requirements: None  
Accessories: A) Lot to include: (35) #2448BR shelves  
(28) #86P posts  
Installation Instructions: A) Assemble, set and level as per plan. (Verify actual field dimensions for compliance.)

ITEM #K-52 STAINLESS STEEL DIRTY DISH TABLE

Quantity: (1) each  
Manufacturer: Custom Metal Fabricated  
Model Number: Custom, as per plans and details.  
Dimensions: 8'-0"W x 2'-6"D x 34"H. Verify with field measurements.  
Utility Requirements: None  
Accessories: A) Built-in pre-rinse sink.  
B) 8" back splash.  
C) 3'-6"W Stainless steel under shelf.  
D) Provide trough drain with removable perforated top insert at dishwasher entry.  
Installation Instructions: A) Set and level as per plans.  
B) Clip and seal back splash to wall.  
C) Verify entry requirements of dish machine to gently slope table back to machine.

ITEM #K-53 DISPOSER

Quantity: (1) each  
 Manufacturer: Salvajor  
 Model Number: #200-CA-ARSS-(208/60/3)  
 Dimensions: 13"Diameter x 19"H  
 Utility Requirements: A) 1/2" Cold water.  
 B) 2" Direct drain.  
 C) 208/60/3, 2 HP  
 Accessories: A) 3-1/2" Sink Assembly.  
 B) Pre-wired control panel, mounted to Dirty Dish Table, item #K-52.  
 C) Short body to allow for mounting under sink compartment.  
 Installation Instructions: A) Mount to pre-rinse sink compartment of item #K-52.  
 B) Verify fit under sink.

ITEM #K-54 PRE-RINSE SPRAY

Quantity: (1) each  
 Manufacturer: T&S Brass  
 Model Number: #B-0163/B-0107  
 Dimensions: 33"H  
 Utility Requirements: A) 1/2" hot and cold water.  
 Accessories: A) Provide wall bracket.  
 B) Splash Mount.  
 C) Provide with B-0107 Spray Valve  
 Installation Instructions: A) Mount to Dirty Dish Table, item #K-52, as per plan.

ITEM #K-55 STAINLESS STEEL DISH RACK SHELF

Quantity: (1) each  
 Manufacturer: Custom Metal Fabricator  
 Model Number: Custom, as per plans and details.  
 Dimensions: 4'-10"W x 21"D  
 Utility Requirements: None  
 Accessories: A) Provide with (2) mounting brackets.  
 Installation Instructions: A) Mount to wall at +54" A.F.F. as per plan.  
 B) General Contractor to provide blocking in wall as required.

ITEM #K-56

DISHWASHER TALL CHAMBER with BOOSTER HEATER

- Quantity: (1) each
- Manufacturer: Hobart
- Model Number: #CL-44eN-EGR Electric
- Dimensions: 44"W x 24"D x 69"H
- Utilities:
  - A) 1/2" Hot water connection. 110 F minimum. 15 to 25 PSI required.
  - B) 1/2" Cold water 80 F maximum.
  - C) 1/2" Cold water for drain tempering device.
  - D) 1/8" Inlet to be provided for detergent dispenser as required.
  - E) 2" indirect drain to extra deep floor sink.
  - F) 208/60/3, 55 amp. Motors, Controls and Tank Heat.
  - G) 208/60/3, 83.9 amp. Booster heater.
- Accessories:
  - A) Electric tank heat.
  - B) Left to right operation as per plan.
  - C) Stainless steel finish.
  - D) Electrical booster heater.
  - E) Provide with table limit switch installed in clean dish table, item #K-59.
  - F) Provide drain water tempering kit for installation at drain by plumbing contractor.
- Installation Notes:
  - A) Set and level as per plan.
  - B) Attach dish tables as required.

ITEM #K-57

STAINLESS STEEL VENT HOOD: TYPE II

- Quantity: (1) each
- Manufacturer: AquaMatic
- Model Number: #4824-AM-VHB-G-REM1
- Dimensions: 6'-0"W x 4'-0"D x 2'-6"H
- Utility Requirements:
  - A) Exhaust connection to one 12" diameter exhaust duct collar at 900 CFM for a total exhaust of 900 CFM at 0.105" SP and 1146 duct velocity.
  - B) Mechanical system to provide 720 CFM tempered air while hood is on.
- Accessories:
  - A) Stainless steel enclosure panels to ceiling and trim to wall.
- Installation Instructions:
  - A) Mount from structure above at +6'-9" a.f.f. to the bottom of the hood as per plan. (230) lb.
  - B) General Contractor to provide structural reinforcement and support as required.

ITEM #K-58

STAINLESS STEEL WALL FLASHING

- Quantity: (1) each
- Manufacturer: Custom Metal Fabricated
- Model Number: Custom, as per plans and details.
- Dimensions: 17'-10"W as per plan from base to ceiling (approximately 10'-0"H). Verify with field measurements.
- Utility Requirements: None
- Accessories:
  - A) Provide 20 gauge stainless steel wall flashing from base to ceiling a.f.f., from across full width of dish room wall to end of dish tables, as per plan.
- Installation Instructions:
  - A) Securely mount to wall with high temperature construction adhesive. Seal all penetrations.

ITEM #K-59 STAINLESS STEEL CLEAN DISH TABLE

Quantity: (1) each  
Manufacturer: Custom Metal Fabricated.  
Model Number: Custom.  
Dimensions: 6'-2"W x 2'-6"D x 34"H  
Utility Requirements: None  
Accessories: A) 8" back and side splash.  
B) Provide 4'-0"W under shelf as per plan.  
Installation Instructions: A) Set and level as per plan.  
B) Clip and seal back splash to wall.  
C) Verify entry requirements of dishwasher. Gently slope table back to dishwasher.

ITEM #K-60 SPARE NUMBER

ITEM #K-61 STAINLESS STEEL WALL SHELF

Quantity: (1) each  
Manufacturer: Custom Metal Fabricated  
Model Number: Custom, as per plans and details.  
Dimensions: 5'-0"W x 1'-2"D  
Utility Requirements: None  
Accessories: A) Provide with (2) mounting brackets.  
Installation Instructions: A) Mount to wall at +60" a.f.f., as per plan.  
B) General Contractor to provide blocking as required.

ITEM #K-62 STAINLESS STEEL FOUR COMPARTMENT SINK

Quantity: (1) each  
Manufacturer: Custom Metal Fabricated  
Model #: Custom, as per plans and details.  
Dimensions: 12'-0"W x 30"D x 37"H  
Utility Requirements: A) 1/2" hot and cold water.  
B) 1-1/2" indirect drain.  
Accessories: A) (2) each 14" swing faucets.  
B) (3) each lever operated drain with built in overflow.  
C) (3) each faucet knock outs.  
D) Sink compartments to be 24"W x 24"D.  
E) 24" Drain board on each side.  
F) Back and left side splash.  
Installation Instructions: A) Set and level as per plan.  
B) Clip and seal back splash to wall.

ITEM #K-63 DISPOSER

Quantity: (1) each  
 Manufacturer: Salvajor  
 Model Number: #200-CA-ARSS-(208/60/3)  
 Dimensions: 13"Diameter x 19"H  
 Utility Requirements: A) 1/2" Cold water.  
 B) 2" Direct drain.  
 C) 208/60/3, 2 HP  
 Accessories: A) 3-1/2" Sink Assembly.  
 B) Pre-wired control panel, mounted to Four Compartment Sink, item #K-62.  
 C) Short body to allow for mounting under sink compartment.  
 Installation Instructions: A) Mount to right compartment of Four Compartment Sink, item #K-62.  
 B) Verify fit under sink.

ITEM #K-64 PRE-RINSE SPRAY

Quantity: (1) each  
 Manufacturer: T&S Brass  
 Model Number: #B-0163/B-0107  
 Dimensions: 33"H  
 Utility Requirements: A) 1/2" hot and cold water.  
 Accessories: A) Provide wall bracket.  
 B) Splash Mount.  
 C) Provide with B-0107 Spray Valve  
 Installation Instructions: A) Mount to Four Compartment Sink, item #K-15, as per plan.

ITEM #K-65 STAINLESS STEEL WALL SHELF

Quantity: (1) each  
 Manufacturer: Custom Metal Fabricated  
 Model Number: Custom, as per plans and details.  
 Dimensions: (2) Sections, 8'-6"W and 2'-6"W x 12"D  
 Utility Requirements: None  
 Accessories: A) Provide with (4) mounting brackets.  
 Installation Instructions: A) Mount level to wall at +66" a.f.f. (Verify with User) to top of unit shelf as per plan.  
 B) Provide 12" gap at Pre-Rinse, item #K-64.  
 C) General Contractor to provide wall blocking as required.

ITEM #K-66 STAINLESS STEEL WALL FLASHING

Quantity: (1) lot  
 Manufacturer: Custom Metal Fabricated  
 Model Number: Custom, as per plans and details.  
 Dimensions: 12'-0" W to Ceiling, as per plan.  
 Utility Requirements: None  
 Accessories: A) Provide 20 gauge stainless steel wall flashing on pot sink wall from floor base to ceiling. Provide stainless steel "J" and "T" trim at seams and at top edge.  
 Installation Instructions: A) Securely mount to wall with high temperature construction adhesive. Seal all penetrations.

ITEM #K-67

HOSE REEL

Quantity:

(1) each

Manufacturer:

T&S Brass

Model Number:

#B-1444-CV

Dimensions:

Verify

Utility Requirements:

A) 1/2" Hot & Cold Water.

Accessories:

A) Concealed Installation.

E) Retractable Reel.

F) Provide with continuous pressure back flow preventers.

G) Shut off valve.

H) 50' of hose.

I) High pressure trigger gun spray #MV-2522.

J) Provide with mixing valve mounted to underside front of drainboard

Installation Instructions:

A) Mount to underside of left drain board of Four Compartment Sink, item #K-62.

B) Plumbing Contractor to install mixing valve.

ITEM #E-01

BASE OFFICE COMPUTER: PROVIDED BY OWNER

Quantity:

(1) each

ITEM #E-02

CASHIER REGISTER COMPUTER: PROVIDED BY OWNER

Quantity:

(1) each

**END OF SECTION**

**DIVISION 12 - FURNISHINGS**

Section 12 2413

Roller Shades

Section 12 3200

Manufactured Cabinets and Casework

Section 12 4853.19

Entryway Carpet Tile

Section 12 9000

Building Accessories

Section 12 9313

Bicycle Racks



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## SECTION 12 2413

### ROLLER SHADES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes:
  - 1. Manually operated roller shades.
    - a. At all exterior windows except at the following locations:
      - 1) Aluminum storefront entry systems.
    - b. At the following interior locations: Rooms 1103, 1106, 1221, 1223, 2105, 2106, 2107, 2109, 2108 and where indicated on Drawings.
  - 2. Motorized shade operators.
    - a. At Music Room 1202 storefront windows where indicated on Drawings.
    - b. At Media Center 2322 exterior windows.
    - c. At skylights in Gymnasium, mounted horizontally.
- B. Related Sections include the following:
  - 1. Section 06 1053 "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
  - 2. Division 26 Sections for **electrical service** and connections for motor operators, controls, limit switches, and other powered devices and for system disconnect switches for motorized shade operation.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.
  - 1. Motorized Shade Operators: Include operating instructions.
  - 2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.
- B. Shop Drawings: Show location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other Work, operational clearances, and relationship to adjoining work.
  - 1. Motorized Shade Operators: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
  - 2. Wiring Diagrams: Power, system, and control wiring.
- C. Samples for Verification:
  - 1. For the following products:
    - a. Shade Material: Not less than 3 inches square, with specified treatments applied. Mark face of material.
    - b. Color Selection: Include similar Samples of accessories involving color selection.

- D. Product Certificates: For each type of roller shade product, signed by product manufacturer.
- E. Product Test Reports: For each type of roller shade product.
- F. Qualification Data: For Installer.
- G. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:
  - 1. Methods for maintaining roller shades and finishes.
  - 2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
  - 3. Operating hardware.
  - 4. Motorized shade operator.

#### **1.4 QUALITY ASSURANCE**

- A. Installer Qualifications: An experienced installer who has completed installation of roller shades similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations: Obtain roller shades through one source from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
  - 1. Flame-Resistance Ratings: Passes NFPA 701.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- E. Corded Window Covering Product Standard: Provide roller shades complying with WCMA A 100.1.

#### **1.5 WARRANTY**

- A. Roller Shade Hardware, Chain and Shadecloth: Manufacturer's standard non-depreciating twenty-five year limited warranty.
- B. Roller Shade Motors and Motor Control Systems: Manufacturer's standard non-depreciating five-year warranty.

#### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver shades in factory packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in a window treatment schedule.

## 1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other acceptable manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
  - 1. Manufacturer: MechoShade Systems, Inc.
  - 2. Products:
    - a. Manual Shades: Mecho®/5
    - b. Motorized Shades: Electro®/3; provide Double Shade Bracket #21 with fascia where indicated.
    - c. Fabrics:
      - 1) Translucent: 'EuroTwill' 6000 series.
      - 2) Blackout: 0731 Black/White with black color on the inside and white on the outside.
- B. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by one of the following:
  - 1. Draper, Inc.; [www.draperinc.com](http://www.draperinc.com)
  - 2. Hunter Douglas Contract; [www.hunterdouglascontract.com](http://www.hunterdouglascontract.com).
  - 3. MechoShade Systems, Inc.; [www.mechoshade.com](http://www.mechoshade.com).
  - 4. Skyco; [www.skycoshades.com](http://www.skycoshades.com)

### 2.2 ROLLER SHADES

- A. Shade Band Material: PVC-coated polyester.
  - 1. Material Width: Not less than 96 inches.
  - 2. Bottom Hem: Straight.
  - 3. Trim: As indicated by manufacturer's designation for style and color.
  - 4. Material Openness Factor: Not less than 3 percent
    - a. Pattern: Basketweave using opaque, extruded vinyl-coated polyester yarn.
  - 5. Material Color: As selected by Architect from manufacturer's full range.
  - 6. Blackout Shadecloth: Laminated and embossed vinyl shadecloth.

- B. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets; with removable spline fitting integral channel in tube for attaching shade material. Provide capacity for one roller shade band per roller, unless otherwise indicated on Drawings.
- C. Direction of Roll: Regular, from back of roller.
- D. Mounting Brackets: Galvanized or zinc-plated steel.
- E. Fascia: L-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; continuous panel concealing front and bottom of shade roller, brackets, and operating hardware and operators; length as indicated on Drawings; removable design for access; square front edge.
- F. Top/Back Cover: L shaped; material and finish to match fascia; combining with fascia and end caps to form a six-sided headbox enclosure sized to fit shade roller and operating hardware inside.
- G. Bottom Bar: Steel or extruded aluminum, with plastic or metal capped ends. Provide concealed, by pocket of shade material, internal-type bottom bar with concealed weight bar as required for smooth, properly balanced shade operation.
- H. Audiovisual Light-Blocking Shades: Designed for eliminating all visible light gaps when shades are fully closed; fabricated from blackout shade band material with fascia and bottom bar extended and formed for light-tight joints among shade components and between shade components and adjacent construction.
  - 1. Side Channels, and Perimeter Seals: Manufacturer's standard design, including sill light seal attached to bottom bar, for eliminating light gaps when shades are closed.
- I. Shade Operation: Manual; with continuous loop bead chain, clutch, and cord tensioner and bracket lift operator.
  - 1. Position of Clutch Operator: Right side of roller, as determined by hand of user facing shade from inside, unless otherwise indicated on Drawings.
  - 2. Clutch: Capacity to lift size and weight of shade; sized to fit roller or provide adaptor.
  - 3. Loop Length: Length required to make operation convenient from floor level.
  - 4. Bead Chain: Nickel-plated metal.
  - 5. Cord Tensioner Mounting: Sill.
  - 6. Operating Function: Stop and hold shade at any position in ascending or descending travel.
- J. Shade Operation: Motorized operators as noted below.
- K. Mounting: Bottom-up brackets mounting permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.
- L. Hold-Down Brackets and Hooks or Pins and Side Channels: Provide manufacturer's standard for fixing shade in place, keeping shade band material taut, and reducing light gaps when shades are not mounted vertically but are at an angle, horizontal or other conditions where light gaps could occur.

## 2.3 ROLLER SHADE FABRICATION

- A. Product Description: Roller shade consisting of a roller, a means of supporting the roller, a flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade.
- B. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
  - 1. Lifting Mechanism: With permanently lubricated moving parts.
- C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 degrees F:
  - 1. Shade Units Installed between (Inside) Jambs: Edge of shade not more than 1/4 inch from face of jamb. Length equal to head to sill dimension of opening in which each shade is installed.
  - 2. Shade Units Installed Outside Jambs: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- D. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting fascia, roller, and operating hardware and for hardware position and shade mounting method indicated.
- E. Installation Fasteners: Not fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.
- F. Color-Coated Finish: For metal components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.
- G. Colors of Metal and Plastic Components Exposed to View: As selected by Architect from manufacturer's full range, unless otherwise indicated.

## 2.4 MOTORIZED ROLLER SHADE OPERATORS

- A. General: Provide factory-assembled motorized shade operation systems designed for lifting shades of type, size, weight, construction, use, and operation frequency indicated. Provide operation systems of size and capacity and with features, characteristics, and accessories suitable for Project conditions and recommended by shade manufacturer, complete with electric motors and factory-prewired motor controls, remote-control stations, remote-control devices, power disconnect switches, enclosures protecting controls and all operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with the building electrical system.
- B. Standards: Comply with NFPA 70.
- C. Control Equipment: Comply with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6 with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.

- D. Electric Motors: UL-approved or -recognized, asynchronous, totally enclosed, insulated, capacitor-start motors, complying with NEMA MG 1, with thermal overload protection, brake, permanently lubricated bearings, and limit switches; sized by shade manufacturer to start and operate size and weight of shade considering service factor or considering Project's service conditions without exceeding nameplate ratings.
  - 1. Service Factor: According to NEMA MG 1, unless otherwise indicated.
  - 2. Motor Characteristics: Single phase, 110 V, 60 Hz.
  - 3. Motor Mounting: Within manufacturer's standard roller enclosure.
- E. Position of Motor and Electrical Connection: Right side of roller, as determined by hand of user facing shade from inside, unless otherwise indicated on Drawings.
- F. Remote Controls: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting; MechoShade IQ/MLC® or equivalent, as judged by the Architect. Provide the following devices for remote-control activation of shades:
  - 1. Group Control Stations: Maintained-contact, three-position, rocker-style, wall switch-operated control station with open, close, and center off functions for single-switch group control; Mechoshade Master Plus Low Voltage or equivalent, as judged by the Architect.
    - a. Color: White.
- G. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop shade at fully raised and fully lowered positions.
- H. Operating Function: Stop and hold shade at any position.
- I. Operating Features: Include the following:
  - 1. Group switching with integrated switch control; single face plate for multiple switch cut-outs.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 ROLLER SHADE INSTALLATION**

- A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.
- B. Connections: Connect motorized operators to building electrical system.
- C. Horizontal installations: Install roller shades horizontally, at skylights, where indicated on the drawings.

### **3.3 ADJUSTING**

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

### 3.4 CLEANING AND PROTECTION

- A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. **Replace damaged roller shades** that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

### 3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain systems. Refer to Division 1 Section "Closeout Procedures."

**END OF SECTION**



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## SECTION 12 3200

### MANUFACTURED CABINETS AND CASEWORK

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

##### 1.2 SUMMARY

- A. Section includes custom milled plastic laminate cabinets and casework, shelving, brackets, supports, hardware, and accessory items.
  - 1. Work includes countertops.
  - 2. Work includes cushions.
- B. Related Sections:
  - 1. Section 06 2000 "Finish Carpentry" for solid surface window sills and wall caps.
  - 2. Section 08 1416 "Flush Wood Doors" for passage doors in hollow metal frames.
  - 3. Section 10 2600 "Wall Guards" for bumpers for walls and casework.
  - 4. Section 11 4000 "Food Service Equipment" for application of quartz countertops on serving counters.
- C. Work not included:
  - 1. Plumbing, electrical, heating and ventilation service connections.
  - 2. Rubber or vinyl finish base.
  - 3. Blocking in walls as required for proper installation.

##### 1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's product data for each product and process specified as work of this section and incorporated into items of architectural woodwork during fabrication, finishing, and installation.
- B. Quality Certification: Submit woodwork Manufacturer's (Fabricator's) certification, stating that fabricated woodwork complies with quality grades and other requirements indicated.
- C. Shop Drawings: Submit shop drawings showing location of each item, dimensioned plans and elevations, large scale details, attachment devices and other components. Reuse of Architect's drawings not permitted.
- D. Samples: Submit the following samples:
  - 1. Plastic laminate, 8 inch x 10 inch for each type, color, pattern and surface finish.
  - 2. Fabric: 12 inches x full width of bolt for each type, color, and pattern.

## 1.4 QUALITY ASSURANCE

- A. AWS Quality Standard: Comply with applicable requirements of Architectural Woodwork Standards (AWS) - 2nd Edition, except as otherwise indicated.
1. Millwork and installation shall be in accordance with Custom or Premium Grade of the Architectural Woodwork Standards (AWS), as indicated herein or on the Drawings. If provisions of the Grade specified are in conflict with, or modified by the Drawings or Specifications, the higher quality, better grade or greater quantity shall govern. Notify Architect of any conflicts prior to proceeding with fabrication.
  2. Prior to delivery to Project site, millwork supplier shall provide documentation to the Architect:
    - a. If a Woodwork Institute (WI) licensee: a WI Certified Compliance Certificate with original submittals indicating the millwork products furnished for the project and certifying that these products and their installation will full meet all the requirements of the AWS grade(s) specified and the Contract Documents.
    - b. If a non-WI licensee: a WI Certified Compliance Tracking Acknowledgement with the original submittals, that they have arranged for inspection by a WI inspector after completion of fabrication and installation. If all conditions are found to be compliant, the WI inspector will issue a Certified Compliance Certificate, indicating the millwork products furnished for this project, and certifying that these products and their installation fully meet the requirements of the AWS grades(s) specified and the Contract Documents.
    - c. Each casework elevation shall bear a WI Certified Compliance label.
    - d. Each countertop shall bear a WI Certified Compliance label.
  3. Millwork contractor and installer shall include in their bid any and all costs for certified compliance. Under no circumstance shall the Owner incur additional expense due to the failure of the millwork to comply with AWS standards or to pass any inspection. Issuance of a Certified Compliance Certificate is a pre-requisite for final acceptance and final payment.
- B. Installer Qualifications: Arrange for installation of architectural woodwork by a firm which can demonstrate successful experience in installing architectural woodwork items similar in type and quality to those required for this project.
- C. Measurements: Before proceeding with fabrication of woodwork required to be fitted to other construction, obtain field measurements and verify dimensions and shop drawing details as required for accurate fit.
- D. Casework Integrity
1. All cabinets shall satisfy the AWS Appendix A testing standards:
    - a. Structural Integrity Test (Base and wall cabinets)
    - b. Concentrated Load Test (Base cabinet)
    - c. Torsion Test (Base cabinet)
    - d. Door Durability Test
    - e. Door Impact Test
    - f. Door Hinge Test
    - g. Drawer Bottom Impact Test
    - h. Drawer Support Test
    - i. Drawer and Door Pull Test
    - j. Drawer Rolling Load Test
    - k. Shelf Load Test

- E. Testing
  - 1. Owner reserves the right to take random sampling of casework components to verify that the materials and construction are as specified. In the event that one such sampling proves to be inferior to that which is specified, it shall be assumed the entire installation does not conform to the requirements of the Contract Documents. Supplier shall, at their own expense, replace all components subsequently determined to be inferior; the supplier shall provide the quality of casework to the satisfaction of the Owner.

## 1.5 DELIVERY, STORAGE AND HANDLING

- A. Protect woodwork during transit, delivery, storage and handling to prevent damage, soiling and deterioration.
- B. Do not deliver woodwork, until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, woodwork must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

## 1.6 PROJECT CONDITIONS

- A. Conditioning: Woodwork Manufacturer and Installer shall advise Contractor of temperature and humidity requirements for woodwork installation and storage areas. Do not install woodwork until required temperature and relative humidity have been stabilized and will be maintained in installation areas.
- B. Maintain temperature and humidity in installation area as required to maintain moisture content of installed woodwork within a 1.0 percent tolerance of optimum moisture content, from date of installation through remainder of construction period. Require Woodwork Manufacturer to establish optimum moisture content and required temperature and humidity condition.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER

- A. Acceptable Mills: Subject to compliance with requirements of Contract Documents, provide casework by one of the mills listed below. If not listed, submit as a substitution according to the Conditions of the Contract and provisions of Division 1 sections. Additionally, mills seeking qualification shall provide list of comparable projects in size and scope with education clients.
  - 1. Huetter Mill and Cabinet Company.
  - 2. Granite Mill and Fixture Company.
  - 3. Swainston Mill.
  - 4. Johnson Brothers.
- B. Acceptable Laminate Manufacturers: Subject to compliance with requirements of Contract Documents, provide plastic laminate by one of the manufacturers listed below. If not listed, submit as a substitution according to the Conditions of the Contract and provisions of Division 1 sections.
  - 1. Formica Corp.
  - 2. Pionite
  - 3. WilsonArt.
  - 4. Chemetal (magnetic dry-erase laminates only).

- C. Acceptable Solid Surface/Quartz Surface Manufacturers: Subject to compliance with requirements of Contract Documents, provide solid surface materials by one of the manufacturers listed below. If not listed, submit as a substitution according to the Conditions of the Contract and provisions of Division 1 sections.
1. Radianz, Staron Solid Surfaces; Lotte Advanced Materials.

## 2.2 MANUFACTURED UNITS

- A. Cabinets:
1. Quality Standard: Comply with AWS Section 10, Custom grade, flush overlay design.
  2. Vertical Surface High Pressure Plastic Laminate:
    - a. High pressure plastic laminate for exterior surfaces shall be NEMA vertical grade 0.028 inch thickness, satin finish. Colors are to be selected from manufacturer's full color selection, including polished mirror types. Cabinet fronts for each individual cabinet shall be one color only.
    - b. Balancing sheet on inside of doors, drawer fronts and finished ends shall be high pressure plastic laminate cabinet liner matching cabinet interior.
  3. Horizontal Surface High Pressure Plastic Laminate: High pressure plastic laminate for countertops and other horizontal surfaces shall be post-forming grade 0.039 inch thickness, satin finish. Colors to be selected from manufacturer's full color selection.
  4. Thermo-Fused Melamine to Particle Board:
    - a. Melamine thermo-fused to a 45 pound density or better particle board substrate. Color shall be white.
    - b. White colored melamine shall be standard for all cabinet interiors whether exposed or semi-exposed.
  5. Hardboard:
    - a. Hardboard for dividers shall be 1/4 inch tempered hardboard smooth both sides. Color shall be dark brown.
    - b. Hardboard exposed one side for cabinet backs and drawer bottoms shall be 1/4 inch thick and pre-finished one side to match cabinet interiors.
- B. Laminate Grade for Exposed Surfaces: Provide laminate cladding complying with the following requirements for type of surface and grade.
1. Horizontal Surfaces Other Than Tops: GP-50 (0.050 inch nominal thickness).
  2. Postformed Surfaces: PF-42 (0.039 inch nominal thickness).
- C. Magnetic, Dry-Erase Laminates: High pressure plastic laminate with layer of foil iron sandwiched in the HPL backer; 0.43 inch thickness; gloss finish with dry erase capability.
1. Chemetal 152 "White Gloss Magnetic Dry Erase", or equivalent as judged by Architect
- D. Edge-banding:
1. Edge-banding for cabinet body parts shall be purified 3 mm PVC applied with hot melt glue by automatic edge-banding equipment. Color shall be as selected by Architect from manufacturers full color range.
  2. Edge-banding for door and drawer fronts shall be purified 3 mm PVC applied with hot melt glue by automatic edge-banding equipment. Edges and corners shall be rounded with a 3mm radius and scraped free from machining or chatter marks. Color shall be as selected by Architect from manufacturers full color range.

## 2.3 MISCELLANEOUS MATERIALS

- A. Screws: Select material, type, size and finish required for each use. Comply with FS FF-S-111 for applicable requirements.
1. For metal framing supports, provide screws as recommended by metal framing manufacturer.
- B. Nails: Select material, type, size and finish required for each use. Comply with FS FF-N-105 for applicable requirements.
- C. Anchors: Select material, type, size and finish required by each substrate for secure anchorage. Provide non-ferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion-resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts and anchors, as required, to be set into concrete or masonry work for subsequent woodwork anchorage.
- D. Finish Hardware:
1. Hinges: "European" style 170 degree opening press-in, self-closing hinges; Blum CLIP Top 71T6580 or equivalent with cam adjustable wing mounting plates.
  2. Drawer Slides:
    - a. Standard drawers: Blum Series 230E or equivalent with 100 pound rating and baked enamel corrosion resistant finish.
    - b. File drawers/paper drawer: KV 8500 or equivalent full extension with 150 pound rating.
  3. Pulls: Liberty Hardware, semi circular tapered bow wire steel pull with satin nickel finish, 128 mm C-to-C, model no. P84612-SN-C1 or equivalent
  4. Adjustable Shelf Supports:
    - a. Adjustable shelves shall be supported on adjustable shelf supports inserted in shelf holes drilled into the case ends or partitions and adjustable on 1 1/2" centers. Supports to be KV 346 clips.
  5. Wardrobe Clothes Rod: KV 660SS with stainless steel finish or equivalent. Sockets shall be KV 734 chrome finish.
  6. Locks: Drawer and Door Locks: 5-pin tumbler, complying with ANSI/BHMA A156.11 Grade 1. Cam type locks are not acceptable. Locks for 3/4 inch hinged doors to have master keyed in accordance with Owner's keying requirements.
    - a. Acceptable Manufacturers:
      - 1) CCL #0737/0738
      - 2) Olympus Lock #100DR/200DW
      - 3) CompX National #C8173/C8179.
  7. Inactive Leaf Latch: Ives Elbow Cabinet Catch # IVE-2A92, aluminum, spring loaded, surface mounted; 1-3/8 inch W x 1-3/8 inch H; with 5/8 inch x 3/4 inch H strike.
  8. Coat Hooks: Ives 572 F-15C.1 dull chrome.
  9. Wall Shelf Standards: KV 82; heavy-duty, double-tracked, double-formed, 2 inch based standards. Epoxy powder finish.
  10. Wall Shelf Brackets: KV 182; 1 inch wide x 5/8 inch deep double slotted brackets adjustable on 1-3/4 inch centers.
  11. File drawer slides: KV 8500 full extension.
  12. Screws: Reed and Prince square drive screws. Standard wood screws and sheet metal screws are not acceptable.
  13. Casters: PPI, Heavy Duty Plastic Wheel, 4 inch diameter x 1-1/4 inch tread width, plain bearing, 300 lb. capacity, 5-1/8 inch high, swivel operation, no. 20-40S-A1-HP-TB (top lock brake).

14. Fully Articulated Keyboard Arm: Hafele, 632.68.301, Black Steel epoxy coated.
  15. Keyboard Tray: Hafele, 632.68.490, black, steel epoxy-coated
  16. Cable Grommets: Hafele, 429.94.310, zinc die-cast, black finish.
  17. Wire Manager: (To hold computer wiring underneath counters and desks) Doug Mockett & Company, Inc., Large J-Shaped Wire Manager with Flange, model # WM22A or equivalent.
    - a. Size: 4 5/16 inch x 1 3/32 inch with a 2 9/16 inch tray.
  18. Tote Bins: The Fabri-Form Company, model #T183 or equivalent; [www.fabri-form.com](http://www.fabri-form.com); styrene; high gloss.
    - a. Size: 14 inches L x 12 inches W x 4 inches D.
    - b. Colors: Multiple colors as selected by Architect from manufacturer's full range.
- E. Cushions
1. Polyurethane Foam Padding: Multi-density polyurethane foam per ASTM D 3770; complying with ASTM D 3453, for Dynamic Fatigue Performance Grade AD (heavy duty use) and BD (normal duty use) and for load bearing and general physical properties, of grade which is standard for kind of seat construction and fabric covering indicated.
  2. Cushion Fabric: 100 percent silicone with polyester backing.
    - a. Manufacturer: Momentum Textiles; [www.memosamples.com](http://www.memosamples.com)
      - 1) Series: Silica.
      - 2) Pattern: Scout.
    - b. Color: Color as indicated in the Color Schedule or if not indicated then as selected by Architect from manufacturer's full range of available colors.

## 2.4 FABRICATION

- A. General:
1. Wood Moisture Content: Comply with requirements of referenced quality standard for moisture content of lumber at time of fabrication and for relative humidity conditions in the installation areas.
  2. Dimensions and profiles: Fabricate woodwork to dimensions, profiles, and details indicated with openings and mortises precut, where possible, to receive hardware and other items and work.
  3. Edges: Ease edges to a 1/16 inch radius, for corners of cabinets and edges of solid wood (lumber) members less than 1 inch in nominal thickness, 1/8 inch radius for edges of rails and similar members over 1 inch" in nominal thickness.
  4. Pre-assembly: Complete fabrication, assembly, finishing, hardware application, and other work before shipment to project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
  5. Pre-Cut Openings: Fabricate architectural woodwork with pre-cut openings, where possible, to receive hardware, appliances, plumbing fixtures, electrical work and similar items. Locate openings accurately and use templates or roughing-in diagrams for proper size and shape. Smooth edges of cutoffs and, where located in countertops and similar exposures seal edges of cutouts with a water-resistant coating.

## 2.5 COMPONENT CONSTRUCTION

- A. Toe Kicks: Fixed cabinet bases shall be constructed of 3/4 inch exterior grade oriented strand board with 2x4 fir stringers. Bases shall be leveled and anchored to the floor in continuing lengths to ensure straight and true lines of casework. Rubber, vinyl, or other finished base shall be furnished and installed by others.

- B. Core Material:
1. Core Material (Cabinet bodies and faces): Premium multi-core panel products; hardboard-faced plywood with softwood veneer innerplies.
    - a. Available Manufacturers: Subject to compliance with Contract Documents, products which may be incorporated into the Work include but are not limited to, the following:
      - 1) Plyron.
      - 2) Rigidply.
  2. Core Material (Miscellaneous components, drawer bodies, etc.): Premium grade particleboard of balanced construction with a density of 45 lbs. per cubic foot and moisture content of 8 percent or less. Face screw holding shall be a minimum of 320 lbs. withdrawal.
- C. Case Body:
1. Ends: Case ends shall be 3/4 inch fused melamine laminated to core material with phenolic backer on concealed side. Exposed exterior cabinet ends shall be laminated with vertical grade high pressure plastic laminate. Exposed edges shall be edges with 3 mm PVC edge-banding. Holes shall be drilled for adjustable shelf supports at 1-1/4 inch centers.
  2. Cabinet Top and Bottom:
    - a. Base and tall cabinet top and bottom shall be 3/4 inch thick with melamine thermo-fused to core material and phenolic backer sheets on concealed sides.
    - b. Wall cabinet top and bottom shall be 1 inch thick for cabinets 36 1/2 inch and wider. Melamine thermo-fused to core material on both sides.
    - c. All exposed edges shall be banded with 3 mm inch PVC edge-banding.
  3. Adjustable Shelves:
    - a. Adjustable shelves shall be 3/4 inch thick with melamine thermo-fused to core material on both sides for shelves up to 30 inch in width, and 1 inch thick for shelves over 30 inch in width.
    - b. Library bookshelves shall be 1 inch thick.
    - c. All exposed edges shall be banded with 3 mm thick PVC.
    - d. All shelves to be adjustable on 1 1/4 inch centers.
  4. Cabinet Backs:
    - a. Cabinet backs shall be 1/4 inch thick pre-finished hardboard for use in cabinets with or without doors and shall be recessed into ends and sides. The 1/4 inch is backed up with 4 inch x 3/4 inch hanging cleats on the back side.
    - b. Exposed back shall be 3/4 inch thick with melamine thermo-fused to core material on interior and high pressure plastic laminate on exterior surface.
- D. Doors and Drawer Fronts:
1. Plastic Laminate Doors and Drawer Fronts: Plastic laminate doors and drawer fronts shall be 3/4 inch thick for all hinged and sliding doors with vertical grade high pressure plastic laminate exterior face and white cabinet liner on interior face.
    - a. Core material to be 11/16 inch thick.
  2. Stile and Rail Doors:
    - a. Stile and rail doors shall be a 3/4 inch door blank with a cutout to provide 3 inch wide stile and 3 inch rail top and bottom. 1/4 inch thick plate glass is fitted to cut-out and stopped with a white color removable vinyl extrusion.
    - b. Doors and drawer fronts shall have edges with 3 mm edge-banding in color to match plastic laminate.



- E. Drawers:
1. Drawer box sides, backs, and sub-fronts shall be 5/8 inch thick with melamine thermo-fused to 45 lb density particle board. Exposed top edges shall be banded with 3 mm PVC.
  2. Drawer bottoms shall be 1/4 inch thick pre-finished hardboard recessed into the sides, backs and sub-front.
  3. Paper storage drawers shall be fitted with a hood at back for paper retainage, and shall have a 1/2 inch thick reinforced bottom.
  4. Drawer fronts shall be mounted with an adjusting mechanism to allow full adjustability and alignment in field.
- F. Vertical and Horizontal Dividers:
1. Vertical and horizontal dividers shall be 1/4 inch tempered hardboard smooth both sides or 3/4 inch thermo-fused melamine mounted to 45 lb density particle board as required by cabinet construction requirements.
- G. Joinery:
1. All parts shall be accurately machined and fit for square and true.
  2. Cabinet components shall be doweled into ends using 10mm hardwood dowels 4 inch on center, securely glued.
  3. All backs shall be rabbeted into case, glued and stapled at four inches on center. 4 inch wide rails will be mounted on backs for installation purposes, one top and one bottom in wall and base cabinets. Three rails will be used for all tall cabinets.
  4. Drawer bodies shall be box type construction with detachable drawer fronts. Joints shall be securely fastened with hardwood dowels and glue.

## 2.6 PLASTIC LAMINATE COUNTERTOPS

- A. Quality Standard: Comply with AWS Section 11 requirements for countertops.
1. Grade: Premium
- B. Post formed with fully radiused edge (full bullnose), 1/32 inch high pressure plastic laminate over a 45 pound density, or better, particle board substrate. Bullnose edge shall project 1-1/2 inches beyond face of cabinet.
1. Wrap laminate the full radius of edge and return beyond the cabinet face. NO gap between edge of wrapped laminate and face of cabinet.
- C. Provide 4 inch high covered integral backsplash and endsplash at all countertops.
- D. Seal penetrations with silicone.

## 2.7 SOLID SURFACE AND QUARTZ-SURFACING-MATERIAL COUNTERTOPS

- A. Quartz: Homogeneous mixture containing 93 percent pure quartz with additions of high performance polyester resin, pigments and special effects.
- B. Solid Surface Material: Homogenous sheet composed of a blend of natural minerals and 100 percent acrylic resin (methyl methacrylate) complying with ANSI Z124.3 and Z124.6, Type 6.
- C. Quality Standard: Comply with AWS Section 11 requirements for countertops.
1. Grade: Premium.
- D. Thickness: 3/4 inch.

- E. Adhesives: As recommended by quartz surfacing manufacturer for specific application.

### **PART 3 - EXECUTION**

#### **3.1 PREPARATION**

- A. Condition woodwork to average prevailing humidity conditions in installation areas prior to installing.
- B. Prior to installation of architectural woodwork, examine shop fabricated work for completion, and complete work as required, including back priming and removal of packing.

#### **3.2 INSTALLATION**

- A. Install woodwork plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level (including tops); and with no variations in flushness of adjoining surfaces.
- B. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
- C. Anchor woodwork to anchors or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fasteners heads are required, use fine finishing nails for exposing nailing, countersunk and filled flush with woodwork, and matching final finish where transparent finish is indicated.
- D. Provide sink and fitting cut outs. Installation of sinks, fittings, plumbing rough-in and final connection, and electrical rough and final connection shall be by Divisions 15 and 16.
- E. Provide seismic bracing when required in accordance with the International Building Code, latest edition.

#### **3.3 CLEANING AND ADJUSTING**

- A. Repair damaged and defective woodwork where possible to eliminate defects functionally and visually; where not possible to repair replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate and adjust hardware.
- C. Clean woodwork on exposed and semi-exposed surfaces. Touch-up shop-applied finishes to restore damaged or soiled areas.

#### **3.4 PROTECTION**

- A. Provide final protection and maintain conditions, in a manner acceptable to Fabricator and Installer, which ensures architectural woodwork being without damage or deterioration at time of substantial completion.

**END OF SECTION**

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## SECTION 12 4853.19

### ENTRYWAY CARPET TILE

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Carpet for building entrances.

##### 1.3 SUBMITTALS

- A. Product Data: Include manufacturer's specifications and installation instructions, construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of entryway carpet tile specified.
- B. Samples for Selection: For each type of entryway carpet tile indicated.
- C. Maintenance Data: For cleaning and maintaining entryway carpet tile to include in maintenance manuals.

##### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain entryway carpet tile through one source from a single manufacturer.
- B. Accessibility Requirements: In addition to requirements of authorities having jurisdiction, provide installed entryway carpet tile that comply with Sections 302 and 303 in ICC A117.1.

#### PART 2 - PRODUCTS

##### 2.1 MANUFACTURERS

- A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other manufacturers offering products with equivalent characteristics, including color, may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
  - 1. Manufacturer: Shaw Contract
  - 2. Product: Collection "All Access", Style "Portal Tile" #5T035

- B. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents, provide products by one of the manufacturers listed below. If not listed, submit as a substitution according to the Conditions of the Contract and the provisions of Division 1 Sections.
1. Shaw Contract Group.
  2. Lees Carpet, a brand of the Mohawk Group.
  3. Tandus-Centiva, a Tarkett Company.

## **2.2 ENTRYWAY CARPET TILE**

- A. General: Provide colors, patterns, and profiles selected by Architect from manufacturer's full range.
- B. Characteristics:
1. Construction: Multi-level patterned loop.
  2. Gauge: 1/12
  4. Stitches: 8.5 per inch.
  5. Finished Pile Thickness: 0.129 inch.
  6. Face Yarn: Ecosolution Q Nylon.
  7. Dye Method: Solution dyed.
  8. Face Weight: 28 ounces/square yard.
  9. Size: 24 x 24 inch tiles.
  10. Backing Material: Ecoworx Tile.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, and floor conditions for compliance with requirements for location, sizes and other conditions affecting installation of floor mats and frames.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. Conform to requirements of the Carpet and Rug CRI 104 for preparation and installation of entryway carpet tile.
- B. Install product in accordance with manufacturer's installation instructions. Product must have low VOC, factory applied, "dry" adhesive. A peel & stick method applied to the back at the time of manufacture is preferred.
- C. Verify product match before cutting to ensure minimal variation between dye lots.
- D. Layout product in accordance with shop drawings.
1. Align run of pile in same direction as anticipated traffic and in same direction on adjacent pieces.
  2. Locate change of color or pattern between rooms under door centerline.
- E. Install product tight and flat on sub-floor, well-fastened at edges, with a uniform appearance.

- F. Double-cut product seams with accurate pattern match. Make cuts straight, true, and unfrayed.
- G. Seal seams with manufacturer's recommended seam sealer as stated in installation instructions. Make sure the seam is fully sealed.
- H. Roll with appropriate roller for complete contact of product with adhesive to sub-floor.
- I. Trim carpet neatly at walls and around interruptions.
- J. Completed product is to be smooth and free of bubbles, puckers, and other defects.
- K. Install carpet base tight to wall and to floor mat.

### **3.3 PROTECTION**

- A. Defer installation of entryway carpet tile until Project is near Substantial Completion.

**END OF SECTION**

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## SECTION 12 9313

### BICYCLE RACKS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following site furnishings:
  - 1. Bicycle racks.
- B. Related Sections include the following:
  - 1. Section 03 3000 "Cast-in-Place Concrete" for installation of pipe sleeves cast in concrete footings.
  - 2. Section 31 1000 "Earthwork" for excavation for installation of concrete footings.
- C. Products furnished, but not installed under this Section, include pipe sleeves to be cast in concrete footings.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, field-assembly requirements, and installation details.
- B. Samples for Selection: For units with factory-applied color finishes.
- C. Maintenance Data: For bicycle racks to include in maintenance manuals.

##### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of bicycle racks through one source from a single manufacturer.

#### PART 2 - PRODUCTS

##### 2.1 MATERIALS

- A. Steel: Free from surface blemishes and complying with the following:
  - 1. Plates, Shapes, and Bars: ASTM A 36/A 36M.
  - 2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53, or electric-resistance-welded pipe complying with ASTM A 135.
  - 3. Tubing: Cold-formed steel tubing complying with ASTM A 500.
- B. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials; commercial quality; tamperproof, vandal and theft resistant; concealed, recessed, and capped or plugged. Provide as required for site and street furnishings' assembly, mounting, and secure attachment.



- C. Non-shrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.
- D. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:
  - 1. Zinc-Coated Tubing: External, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. of zinc after welding, a chromate conversion coating, and a clear, polymer film. Internal, same as external or consisting of 81 percent, not less than 0.3-mil- thick, zinc pigmented coating.
  - 2. Hot-Dip Galvanizing: According to ASTM A 123/A 123M, ASTM A 153/A 153M, or ASTM A 924/A 924M.

## 2.2 BICYCLE RACKS

- A. Basis of Design: Contract Documents are based on product of manufacturer listed below to establish a standard of quality. Other available manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
  - 1. Manufacturer: Graber Manufacturing, Inc.; [www.madrax.com](http://www.madrax.com)
  - 2. Product: Madrax Gridrac Grid Bike Rack #GR112
- B. Description
  - 1. Frame: Galvanized steel.
    - a. Pipe OD: Not less than 2-1/2 inches.
  - 2. Style: Double-side grid type.
  - 3. Overall Dimensions: 111 inches L x 42 inches W and not less than 36 inches H.
  - 4. Capacity: Designed to accommodate not less than 18 bicycles.
  - 5. Security: Designed to lock wheel.
  - 6. Accessories: Base covers for each pipe and tubing anchored end.
  - 7. Installation Method: Surface flange anchored below finished grade to substrate indicated on Drawings.
  - 8. Steel Finish: Galvanized.

## 2.3 FABRICATION

- A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.
- B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.
- C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- D. Steel and Iron Components: Galvanized. Bare metal steel or iron components are not permitted.
- E. Exposed Surfaces: Polished, sanded, or otherwise finished; smooth all surfaces, free

from burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.

- F. Factory Assembly: Assemble components in the factory to the greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

## **2.4 FINISHES, GENERAL**

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION, GENERAL**

- A. Comply with manufacturer's written installation instructions, unless more stringent requirements are indicated. Complete field assembly of bicycle racks, where required.
- B. Unless otherwise indicated, install bicycle racks after landscaping and paving have been completed.
- C. Install bicycle racks level, plumb, true, and securely anchored at locations indicated on Drawings.
- D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
- E. Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

### **3.3 CLEANING**

- A. After completing bicycle rack installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

**END OF SECTION**

**DIVISION 13 – SPECIAL CONSTRUCTION**

Not Used

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**DIVISION 14 – CONVEYING EQUIPMENT**

Section 14 2400

Hydraulic Elevators

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## SECTION 14 2400

### HYDRAULIC ELEVATORS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes hydraulic passenger elevators.
- B. Related Sections include the following:
  - 1. Section 03 3000 "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
  - 2. Section 04 2223 "Unit Masonry Assemblies" for setting sleeves, inserts, and anchoring devices in masonry and for grouting elevator entrance frames installed in masonry walls.
  - 3. Section 05 1200 "Structural Joists" for the following:
    - a. Attachment plates, angle brackets, and other preparation of structural steel for fastening guide-rail brackets.
    - b. Hoist beams.
    - c. Structural-steel shapes for subsills that are part of steel frame.
  - 4. Section 05 5000 "Metal Fabrications" for pit ladder.
  - 5. Division 26 Sections for electrical service for elevators to and including disconnect switches at machine room door.
  - 6. Section 27 1500 "Communications Horizontal Cabling" for telephone service to elevators.

##### 1.3 DEFINITIONS

- A. Definitions in ASME A17.1 apply to work of this Section.
- B. Defective Elevator Work: Operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

##### 1.4 SUBMITTALS

- A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for the following:
  - 1. Car enclosures and hoistway entrances.
  - 2. Operation, control, and signal systems.
- B. Shop Drawings: Show plans, elevations, sections, and large-scale details indicating service at each landing, machine room layout, coordination with building structure, relationships with other construction, and locations of equipment and signals. Include large-scale layout of car control station. Indicate variations from specified requirements, maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.



- C. Samples for Selection: For finishes involving color selection.
- D. Manufacturer Certificates:
  - 1. Signed by elevator manufacturer certifying that hoistway, pit, and machine room layout and dimensions, as shown on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.
  - 2. Signed by elevator manufacturer certifying that controls and related equipment are non-proprietary and that service will not be restricted to original manufacturer or installer.
- E. Qualification Data: For Installer.
- F. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.
- G. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.
- H. Warranty: Special warranty specified in this Section.
- I. Continuing Maintenance Proposal: Service agreement specified in this Section.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Elevator manufacturer or manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Regulatory Requirements: Comply with ASME A17.1 and elevator design requirements for earthquake loads in ASCE 7.
  - 1. Effective peak velocity acceleration ( $A_v$ ) for Project's location is greater than or equal to 0.20 (seismic risk zones 3 and 4).
  - 2. Project's seismic design category is C.
  - 3. Elevator importance factor is 1.0.
- C. Accessibility Requirements: Comply with Section 4.10 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)" and 407 in ICC A117.1.
- D. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10B.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. **Deliver, store, and handle materials**, components and equipment in manufacturer's protective packaging.
- B. **Store materials, components, and equipment** off of ground, under cover, and in a dry location. Handle according to manufacturer's written recommendations to prevent damage, deterioration, or soiling.

## 1.7 COORDINATION

- A. Coordinate installation of sleeves, block outs, and items that are embedded in concrete or masonry for elevator equipment. Furnish templates and installation instructions and deliver to Project site in time for installation.
- B. Coordinate sequence of elevator installation with other work to avoid delaying the Work.
- C. Coordinate locations and dimensions of other work relating to hydraulic elevators including pit ladders, sumps, and floor drains in pits; entrance subsills; and electrical service, electrical outlets, lights, and switches in pits and machine rooms.

## 1.8 WARRANTY

- A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to repair, restore, or replace defective elevator work within specified warranty period.
  - 1. Warranty Period: One year from date of Substantial Completion.

## 1.9 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, provide one year's full maintenance service by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
  - 1. Perform maintenance, including emergency callback service, during normal working hours.
- B. Continuing Maintenance Proposal: Provide a continuing maintenance proposal from Installer to Owner, in the form of a standard one-year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE CRITERIA

- A. Car Speed: +/- 3 % of contract speed under any loading condition or direction of travel.
- B. Car Capacity: Safely lower, stop and hold up to 120% of rated load (code required).
- C. Ride Quality:
  - 1. Vertical Vibration (maximum): 20 milli-g
  - 2. Horizontal Vibration (maximum): 12 milli-g
  - 3. Vertical Jerk (maximum): 4.59 +/- 1.0 ft./ sec<sup>3</sup>
  - 4. Acceleration/Deceleration (maximum): 2.62 ft./ sec<sup>2</sup>
  - 5. In Car Noise: 55 – 60 dB(A)
  - 6. Stopping Accuracy: +/- 0.375 inch max, +/- 0.25 inch Typical
  - 7. Re-leveling Distance: +/- 0.5 inch

## 2.2 MANUFACTURERS

- A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other manufacturers offering products with equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
1. Manufacturer: Otis Elevator Company; Otis.com
  2. Product: Gen3 Core

## 2.3 ELEVATOR DESCRIPTION:

- A. Use of "Basis of Design" language does not modify requirement for non-proprietary controls and diagnostic tools.
- B. Type: Holeless, beside-the-car, single-acting or telescoping, single or dual cylinder.
- C. Rated Load: 3500 lb.
- D. Rated Speed: 150 fpm.
- E. Operation System: Simplex Collective operation.
1. Auxiliary Operations:
    - a. Standby-powered lowering.
    - b. Automatic dispatching of loaded car.
    - c. Nuisance call cancel.
    - d. Firefighters' Service Phase I and Phase II
  2. Security Features: Keyswitch operation.
- F. Car Enclosures:
1. Inside Width: 77 inches (nominal) from side wall to side wall.
  2. Inside Depth: 65 inches (nominal) from back wall to front wall (return panels).
  3. Inside Height: 93 inches to underside of ceiling.
  4. Front Walls (Return Panels): Satin stainless steel, No. 4 finish with integral car door frames.
  5. Car Fixtures: Satin stainless steel, No. 4 finish.
  6. Side and Rear Wall Panels: Plastic laminate; color as sele
  7. Reveals: Satin stainless steel, No. 4 finish.
  8. Door Faces (Interior): Satin stainless steel, No. 4 finish.
  9. Door Sills: Extruded aluminum
  10. Ceiling: Brushed stainless steel with 4 LED lights.
  11. Handrails: 1-1/2 inches round satin stainless steel, No. 4 finish, at sides and rear of car.
  12. Floor: Prepare floor to receive materials by others.
- G. Hoistway Entrances:
1. Width: 42 inches.
  2. Height: 84 inches.
  3. Type: Single-speed side sliding.
  4. Fire-Protection Rating: 1-1/2 hours with 30-minute temperature rise of 450 degrees F.
  5. Frames: Satin stainless steel, No. 4 finish.
  6. Doors: Satin stainless steel, No. 4 finish.
  7. Sills: Extruded aluminum.
  8. Hall Fixtures: Satin stainless steel, No. 4 finish.

9. Additional Requirements:
  - a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, No. 4 finish.
  - b. Fan: One-speed 120 VAC rubber-mounted fan with baffle to diffuse audible noise. Provide a control switch in the car-operating panel.
  - c. Provide blanket hooks and one complete set of full-height protective blankets.

## 2.4 SYSTEMS AND COMPONENTS

- A. General: Provide non-proprietary elevator systems. Where components are not otherwise indicated, provide standard non-proprietary components published by manufacturer as included in standard pre-engineered elevator systems and as required for complete system.
- B. Pump Units: Positive-displacement type with a maximum of 10 percent variation between no load and full load and with minimum pulsations. Provide either of the following:
  1. Pump, with fan-cooled squirrel-cage induction motor, mounted on oil tank with vibration isolation mounts. Enclose pump in prime-painted steel enclosure lined with 1-inch-thick, glass-fiber insulation board.
  2. Submersible pump, with submersible squirrel-cage induction motor, suspended inside oil tank from vibration isolation mounts.
  3. Provide motor with wye-delta or solid-state starting.
    - a. Provide Motion Control Engineering (MCE) controller, or non-proprietary equivalent, including necessary starting switches of adequate size, together with all relays, switches, and hardware required to accomplish the specified operation. Provide overload relays to protect motor. Provide controller with phase monitor for loss prevention.
- C. Hydraulic Silencers: Provide hydraulic silencer containing pulsation-absorbing material in a blowout-proof housing at pump unit.
- D. Piping: Provide size, type, and weight piping recommended by manufacturer, and provide flexible connectors to minimize sound and vibration transmissions from power unit.
  1. Provide dielectric couplings at cylinder units.
  2. Casing for Underground Piping: PVC pipe complying with ASTM D 1785, joined with PVC fittings complying with ASTM D 2466 and solvent cement complying with ASTM D 2564.
- E. Hydraulic Fluid: Nontoxic, readily biodegradable, fire-resistant fluid made from vegetable oil with antioxidant, anticorrosive, antifoaming, and metal-passivating additives and approved by elevator manufacturer for use with elevator equipment.
  1. Product: Subject to compliance with requirements, provide "Hydro Safe" by Hydro Safe Oil Division, Inc. or equivalent as judged by Architect.
- F. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work where installation of devices is specified in another Section.
- G. Car Frame and Platform: Welded steel units.

- H. Guides: Provide either roller guides or sliding guides at top and bottom of car and counterweight frames. If sliding guides are used, provide guide-rail lubricators or polymer-coated, nonlubricated guides.

## **2.5 OPERATION SYSTEMS**

- A. General: Provide non-proprietary microprocessor operation system for each elevator as required to provide type of operation system indicated.
  - 1. Provide a control system manufactured by Motion Control Engineering (MCE) or non-proprietary equivalent system, as required to provide single automatic operation of the type indicated, and as defined in the Code as "Operations".
    - a. Single Elevator Control: Selective Collective Automatic Operation, as defined in ANSI/ASME A17.1.
  - 2. Microprocessor controller unit shall include all diagnostic equipment required to identify malfunctioning processor units, and shall be non-proprietary so that service may be performed by Owner or Owner's selected service vendor.
  - 3. Provide controller with Central Monitoring System (CMS) capabilities, including all software, firmware, and communication parts, and the ability to print out data, along with black box unit cable and hook-up of monitor to ethernet connection.
- B. Single-Car Auxiliary Operations: In addition to primary operation system features, provide the following operational features for elevators where indicated:
  - 1. Standby-Powered Lowering: On activation of standby power, cars are lowered to the lowest floor, open their doors, and shut down.
  - 2. Automatic Dispatching of Loaded Car: When car load exceeds 80 percent of rated capacity, doors will begin closing.
- C. Security Features: Provide the following security features, where indicated. Security features shall not affect emergency firefighters' service.
  - 1. Keyswitch Operation: Push buttons are activated and deactivated by security key-switches at both car control push buttons and hall push-button stations (excluding car push button to level of main egress). Key is removable only in deactivated position.

## **2.6 DOOR REOPENING DEVICES**

- A. Infrared Array: Provide door reopening devices with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more of the light beams shall cause doors to stop and reopen.
  - 1. Provide Adams Gatekeeper or elevator manufacturer's non-proprietary equivalent.
- B. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door reopening device, a loud buzzer shall sound and doors shall begin to close at reduced kinetic energy.

## **2.7 FINISH MATERIALS**

- A. General: Provide the following materials for exposed parts of elevator car enclosures, car doors, hoistway entrance doors and frames, and signal equipment as indicated.
- B. Cold-Rolled Steel Sheet: ASTM A 1008, commercial steel, Type B, exposed, matte finish.
- C. Hot-Rolled Steel Sheet: ASTM A 1011, commercial steel, Type B, pickled.

- D. Stainless-Steel Sheet: ASTM A 240, Type 304.
- E. Stainless-Steel Tubing: ASTM A 554, Grade MT 304.
- F. Nickel Silver Extrusions: ASTM B 151, Alloy UNS No. C74500 or No. C77600.
- G. Plastic Laminate: High-pressure type complying with NEMA LD 3, Type HGS for flat applications and Type BKV for panel backing.

## **2.8 CAR ENCLOSURES**

- A. General: Provide steel-framed car enclosures with non-removable wall panels, with car roof, access doors, power door operators, and ventilation.
  - 1. Provide standard railings complying with ASME A17.1 on car tops where required by ASME A17.1.

## **2.9 HOISTWAY ENTRANCES**

- A. General: Provide manufacturer's standard horizontal-sliding, center bi-parting center doors. Door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Provide frame size and profile to coordinate with hoistway wall construction.
  - 1. Where gypsum board wall construction is indicated, provide self-supporting frames with reinforced head sections.
- B. Materials and Fabrication: Provide manufacturer's standards, but not less than the following:
  - 1. Stainless-Steel Frames: Formed from stainless-steel sheet.
  - 2. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet or by laminating stainless-steel sheet to exposed faces and edges of enameled cold-rolled steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.
  - 3. Sight Guards: Provide sight guards on doors matching door edges.
  - 4. Sills: Extruded metal, with grooved surface, 1/4 inch thick.
  - 5. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.

## **2.10 SIGNAL EQUIPMENT**

- A. General: Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Fabricate lighted elements with long-life incandescent lamps and acrylic or other permanent, non-yellowing translucent plastic diffusers or LEDs.
- B. Car Control Stations: Provide manufacturer's standard recessed or semi-recessed car control stations. Mount in return panel adjacent to car door, unless otherwise indicated.
  - 1. Mark buttons and switches with standard identification for required use or function that complies with ASME A17.1. Use both tactile symbols and Braille.
  - 2. Provide "No Smoking" sign matching car control station, either integral with car control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.
  - 3. Buttons shall be controlled by key operation.

- C. Emergency Communication System: Provide system that complies with ASME A17.1 and the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." On activation, system dials preprogrammed number of monitoring station and identifies elevator location to monitoring station. System provides two-way voice communication without using a handset and provides visible signals that indicate when system has been activated and when monitoring station has responded. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.
- D. Firefighters' Two-Way Telephone Communication Service: Provide telephone jack in each car and required conductors in traveling cable for firefighters' two-way telephone communication service specified in Division 13 Section "Fire Alarm."
- E. Car Position Indicator: Provide illuminated, digital-type car position indicator, located above car door or above car control station. Also provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served.
  - 1. Include travel direction arrows if not provided in car control station.
- F. Hall Push-Button Stations: Provide one hall push-button station at each landing.
  - 1. Provide units with flat faceplate for mounting with body of unit recessed in wall.
  - 2. Equip units with buttons for calling elevator and for indicating desired direction of travel.
  - 3. Buttons shall be controlled by key operation.
- G. Hall Lanterns: Units with illuminated arrows; but provide single arrow at terminal landings. Provide the following:
  - 1. Manufacturer's standard wall-mounted units, for mounting above entrance frames.
- H. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.
  - 1. At manufacturer's option, audible signals may be placed on car.
- I. Hall Position Indicators: Provide illuminated, digital-display-type position indicators, located above hoistway entrance at ground floor. Provide units with flat faceplate for mounting and with body of unit recessed in wall.
- J. Corridor Call Station Pictograph Signs: Provide signs matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire elevators are out of service and exits should be used instead. Provide one sign at each hall push-button station, unless otherwise indicated.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Verify critical dimensions and examine supporting structure and other conditions under which elevator work is to be installed.
  - 1. For the record, prepare a written report, endorsed by Installer, listing dimensional discrepancies and conditions detrimental to performance or indicating that dimensions and conditions were found to be satisfactory.
  - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. Install cylinder plumb and accurately centered for elevator car position and travel. Anchor securely in place, supported at pit floor and braced at intervals as needed to maintain alignment. Anchor cylinder guides at spacing needed to maintain alignment and avoid overstressing guides.
- B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.
- C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts designed to effectively prevent transmission of vibrations to structure and thereby eliminate sources of structure-borne noise from elevator system.
- D. Install piping above the floor, where possible. Where not possible, install underground piping in Schedule 40 PVC pipe casing assembled with solvent-cemented fittings.
- E. Lubricate operating parts of systems as recommended by manufacturers.
- F. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay installation of sills and frames until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.
- G. Leveling Tolerance: 1/4 inch, up or down, regardless of load and direction of travel.
- H. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.
- I. Locate hall signal equipment for elevators as follows, unless otherwise indicated:
  - 1. Locate hall push-button station at location most convenient for approaching passengers.
  - 2. Place hall lanterns either above or beside each hoistway entrance.
  - 3. Mount hall lanterns at a minimum of 72 inches above finished floor.



### 3.3 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of elevator installation and before permitting use (either temporary or permanent) of elevators, perform acceptance tests as required and recommended by ASME A17.1 and by governing regulations and agencies.
- B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times tests are to be performed on elevators.

### 3.4 PROTECTION

- A. **Temporary Use:** Comply with the following requirements for each elevator used for construction purposes:
  - 1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
  - 2. Provide strippable protective film on entrance and car doors and frames.
  - 3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
  - 4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
  - 5. Do not load elevators beyond their rated weight capacity.
  - 6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
  - 7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

### 3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate, adjust, and maintain elevator(s). Refer to Division 1 Section "Demonstration and Training."
- B. Check operation of elevator with Owner's personnel present and before date of Substantial Completion. Determine that operation systems and devices are functioning properly.
- C. Check operation of elevator with Owner's personnel present not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

**END OF SECTION**

# Hillcrest Elementary School Replacement

1300 NORTH ECCLES – OGDEN, UTAH

**OWNER**

OGDEN CITY SCHOOL DISTRICT  
1950 MONROE BLVD.  
OGDEN, UTAH

**PROJECT NO.**

VCBO 22785

**DATE**

08 November 2023

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## SECTION 21 0000

### FIRE PROTECTION

#### PART 1 – GENERAL

##### 1.1 GENERAL CONDITIONS

- A. The requirements of Section 230100, 230800, 230900, and 251000 shall govern the work in Section 210000, where applicable, and where not in conflict with governing codes and ordinances. Division 1 is a part of this and all other sections of these specifications.
- B. **Preferred contractors shall be Preferred Fire Protection, Kimco Fire Protection, Chaparral Fire Protection, Fire Engineering Co., Delta Fire Protection Systems, Intermountain Fire Protection, Western Automatic Fire Protection, Paradise Fire Protection Inc. and Firetrol Protection Systems.**
- C. Contractors not listed on the approved list must submit for approval and review prior to bid as required by bid documents

##### 1.2 SCOPE

- A. The work required includes the designing, hydraulically calculating pipe sizes, flows, and pressure, furnishing and installation of fire protection systems in accordance with the drawings, specifications, latest standards and codes for complete systems for the building.
- B. The work specified in this section shall be installed by none other than a recognized fire sprinkler contractor. All fire protection system piping shall be hydraulically calculated. All systems shall be subject to the inspection and approval of the local fire authority or his representative for compliance of applicable standards.
- C. All work shall be coordinated with other subcontractors.
- D. The sprinkler system shall consist of the required number of sprinkler heads, piping, hangers, drains, test pipes, alarms, valves, gauges, fire department connections, and all other parts to assure a complete system to meet the requirements of the owner's insurance underwriter, local authority having jurisdiction, and in accordance with nationally recognized standards.
- E. Codes & Standards:
  - 1. Water Supply: National Fire Code #24 - International Building Code.
  - 2. Wet Sprinkler System & Combined Systems: N.F.C. #13 and #14 - I.B.C.
  - 3. Alarm Equipment: N.F.C. #70 & 72A
  - 4. Standpipe & Hose Systems: N.F.C. #14 - I.B.C.
  - 5. Supervision: N.F.C. #13 and #14 - I.B.C.
  - 6. Temporary Fire Protection: N.F.C. #14 - I.B.C.
  - 7. Sprinkler Heads: N.F.C. #13
  - 8. Sleeves and Location: N.F.C. #13
  - 9. Excavation and Backfill: 230100 of this specification

F. Work Included Elsewhere:

1. Fire Hydrants - by Site Utility Contractor
2. Underground Mains: I.F.C. #24
3. Concrete Work - by General Contractor
4. Access Doors - By Division 23 Contractor.
5. Painting of sprinkler piping - By Painting Contractor.
6. Color coding or pipe identification - By Mechanical Contractor.
7. Wiring of flow switches and gate valve supervisory switches - By Electrical Contractor.

1.3 WORK BY FIRE PROTECTION CONTRACTOR

A. This contractor shall furnish and install all labor, material, and equipment to make a complete and working fire protection system fully tested and approved in accordance with the drawings, standards of this specification for the new building, and minor system modifications in the existing building.

B. Underground Water Supply:

1. Fire protection contractor shall perform a flow test at or near site prior to final calculations for system. Flow test to be performed in the presence of local fire marshal and Ogden School District representative.
2. Connect fire sprinkler mains to connections provided by others as shown on the drawings and install U.L. labeled pipes into building at locations shown. Coordinate testing and flushing of this portion of the main in accordance with N.F.C. #24 and furnish test certificates to the Owner's representative.
3. This contractor will be responsible to coordinate with the site utilities contractor to assure that the underground water supply has been flushed and tested in accordance with NFPA pamphlet #24 prior to the connection of the overhead sprinkler system.

C. Flow Test Information:

**Test Location:**

Ogden, Utah

**Test Date:**

xxxx xx, 2023

**Residual Pressure:**

00 PSI

**Static Pressure**

00 PSI

**Water Flow:**

000 GPM

\*Fire flows for design calculations shall be taken from test hydrant at front of school.

D. Sprinkler System:

1. This system shall conform to I.F.C. #13 and #14 and I.B.C. Riser may be calculated but shall not be smaller than 6". Sprinkler systems are to be light, ordinary, or extra hazard, as required by NFC-13 and the Utah State Fire Marshall's office.
2. System shall be hydraulically calculated. Sprinkler system shall be light hazard, except for casual ordinary and extra hazard group 1 in storage and service areas. Density for light hazard areas shall be 0.10 gpm per sq. ft. over 1500 sq. ft. Remote area with a maximum head spacing of 225 sq.ft. Service area shall be density of 0.15 over 2000 sq. ft. with maximum spacing of 130 sq. ft.
3. Quick response heads per NFPA 13 are an acceptable alternative if available flow and pressure allows.

1.4 QUALIFICATION OF DESIGNER

- A. Designer shall be an engineering technician or Senior Engineering Technician (Level III or Level IV), NICET certification for fire sprinkler system design.

1.5 QUALIFICATION OF INSTALLER

- A. It is intended that the system be designed and installed by a firm regularly engaged in the design and installation business of Fire Sprinkler contracting. The Owner's representative may require evidence to support the ability of the contractor to perform work in the scope and volume as specified. A contractor, who cannot verify such experience, may be found not suitable to perform the work.

PART 2 – PRODUCTS

2.1 HANGERS

- A. All hangers to be in accordance with NFPA Pamphlet No. 13.

2.2 RISERS

- A. Risers shall be at the locations shown and shall include a U.L. approved control valve, check valve, flow switch, pressure gauges, water motor gong, or electric bell, standard fire department connection, gate valve supervisory switch, test connections, and drains as required.

2.3 SPRINKLER HEADS

- A. Sprinkler heads shall be U.L. approved. "K" factors shall be the same on each system and/or floor. See plans for head types.
- B. Sprinklers shall be of the proper temperature rating. The location of sprinkler head wherever reasonably possible shall be symmetrical and coordinated with the ceiling pattern.
- C. Red bulbs for areas experiencing temperatures of 155 deg. F. or less.
- D. Green bulbs for areas experiencing temperatures exceeding 155 deg. F.
- E. Green bulbs at all skylights.

- F. Number and location of sprinkler heads shown on the drawings are schematic. Exact number and location of heads shall be determined by the system design, and architectural coordination.
- G. Provide dry pendent heads in areas subject to freezing, where wet piping can be run in heated space. Otherwise, provide antifreeze loops.
- H. Provide spare head cabinets in accordance with NFPA No. 13 and equip same with at least ten (10) chrome heads, six (6) white heads, six (6) brass heads, and appropriate wrenches.
- I. Provide head guards in all areas where heads are subject to physical abuse.
- J. Drawings note specific architectural requirements for head spacing and locations. Coordinate with project architect prior to installation.

#### 2.4 VALVES

- A. All valves and fittings shall be listed by Underwriters Laboratories or approved by Factory Mutual for fire protection duty and shall be installed in accordance with their listing and/or approval. Control valve shall have alarm supervisory switches with two sets of contacts and normally open/normally closed.
- B. All indicating valves will be of the listed and/or approved type with an electric tamper switch approved for use with that valve.
- C. Water hammer arrestors shall be provided ahead of all automatic valves to eliminate water hammer and shall be installed vertically in an accessible location.
- D. Hose valves off standpipes shall be U.L. approved. All valves shall be 2-1/2" with 2-1/2" X 1-1/2" reducer and cap with chains. Valves shall be polished brass and chrome plated.

#### 2.5 PIPING

- A. All piping above ground shall be Schedule 40 domestic steel pipe and fittings. Schedule 40 equivalent, Thinwall, Dyna Flow and foreign made pipe or fittings will not be permitted on this project.
- B. Note on plans where specific location and routing of fire piping is shown.
- C. All fire piping shall be run high and tight to structure unless otherwise noted.

#### 2.6 EARTHQUAKE BRACING

- A. Install earthquake bracing in accordance with NFPA #13 Standards and Utah State Fire Marshall's Office.

#### 2.7 SLEEVES

- A. Sleeves shall be furnished, together with their location and elevations to the construction manager, timely with required schedule or concrete pours. If sleeves are missed by this contractor, he shall be responsible for core drilling thru concrete at his own expense, and he shall be responsible for his cutting and patching. Sleeves shall be of the size, type, and length required by N.F.P.A. codes. See Section 230900 for Sleeves".

- B. 1' gap, or as required by State Fire Marshall shall be provided floor sleeve where main fire line enters building.

### PART 3 – EXECUTION

#### 3.1 TEMPORARY FIRE PROTECTION DURING COURSE OF CONSTRUCTION

- A. This contractor shall provide fire protection as required by I.F.C. #14 - Chapter 8 and shall be coordinated with the local fire department.

#### 3.2 SHOP DRAWINGS

- A. Shop drawings, submittals, and hydraulic calculations, as necessary and required, shall be submitted to the Owner's representative for approval prior to incorporating materials or equipment into the work. Shop drawings shall be complete and in accordance with I.F.C. #13, #14, #20, and all applicable standards, submittals, and equipment, valves, flow switches, controls, and other important items shall be complete, showing details, description, and characteristics; hydraulic calculations shall be based on the water system fire flow capacities shown on the drawings and shall show flows, pressures, velocities, pipe size, and equivalent lengths as required for the system.
- B. Calculations shall be arranged in an orderly manner with sufficient reference points for the approving authority to review and approve.
- C. Testing shall be accomplished by this contractor for all required systems, equipment, and appurtenances, as required by the various standards and codes. The Owner's representative shall witness and sign off each item required. This contractor shall furnish required forms.

#### 3.3 TESTS

- A. Install all test pipes and valves as required by NFPA No. 13. Locate inspector's test valves and auxiliary drain valves above ceilings in areas approved by the Architect and provide hose bibb connections. Conduct all tests as required by NFPA Standards and Insurance Services Office and submit copies of completed test forms to the building owner.
- B. All fire sprinkler related tests requiring the witnessing by local authorities will be the responsibility of this contractor. If tests are not run or do not have the proper witness or documentation, then they will be run late and all damage caused by the system, or caused in uncovering the system for such tests, will be borne by this contractor.
- C. The Utah State Fire Marshall and building owner shall be notified (in writing) at least three days in advance of the following:
  - 1. Hydrostatic test and final inspection of the underground, prior to backfilling.
  - 2. Flushing of underground prior to connection to overhead.
  - 3. Hydrostatic test and final inspection of overhead, prior to the installation of the ceilings.
  - 4. 200 PSI for 2 hours minimum test requirements, or as required by State Fire Marshall.



### 3.4 GENERAL REQUIREMENTS

- A. This contractor shall submit complete drawings, hydraulic calculations, and proper documentation to the local authority having jurisdiction and receive their approval before submitting such material to the Owner's representative for final approval. The contractor will be required to show proof of submittal to the Owner's insurance underwriter and local building authorities before installation may begin.
- B. All work of this contractor will be coordinated with other trades to insure minimal changes to the sprinkler system from the designs. Careful coordination of mechanical and electrical ducts, pipe and conduit shall be required. The ceiling cavity must be carefully reviewed and coordinated with all trades. In the event of conflict, the installation of the mechanical equipment and piping shall be in the following order: plumbing waste, rainwater, and soil lines' supply, return, and exhaust ductwork; water piping; fire protection piping; and pneumatic control piping.
- C. Every effort shall be required to ensure that the heads form a symmetrical pattern in the ceiling with the ceiling grid, the lights, and diffusers and grilles and as shown on the Architect's reflected ceiling plan. Offsets shall be made in piping to accommodate ductwork in ceiling. Heads should be symmetrical, and all piping run parallel or perpendicular to building lines. In no case shall sprinkler heads be installed closer than 6" from ceiling grids or closer than approved distances from ceiling obstructions.
- D. All sprinkler piping shall be run concealed unless approved by the Owner's representative. All lines will be run as high as possible so as to not interfere with future changes to ceiling heights or other mechanical equipment. This contractor will be responsible for all sleeves, core drills, and sealing of penetrations in walls, floors, and structural members to facilitate the installation of the system, however, no holes in, or attachments to structural members will be allowed unless approved by the Owner's representative.
- E. All required drains and test pipes will be installed and finished in a workmanlike manner, terminating at a proper location to accommodate the required outflow without damaging the building or landscaping. Drain and test pipe locations shall be approved by the owner's representative.
- F. All piping and heads located in un-heated spaces shall be installed with a glycol loop system. Coordinate location with the owner's representative. Indicating valves with tamper switches shall be installed and wired as required by code. Coordinate with electrical contractor.
- G. No piping or valve assemblies shall be run exposed in a finished area without the prior approval of the owner's representative.

### 3.5 JOB CLOSEOUT

- A. This contractor shall assure that all placards, signs, and instruction manuals are in place, and all tests are run before any consideration for final payment will be considered. This includes maintenance manuals, hydraulic calculations placards, spare head cabinets and the proper number of spare heads, and instruction to on-site personnel.
- B. This contractor shall, in addition to the above, furnish the owner one (1) set of reproducibles of the sprinkler system "record drawings" for his project files.

### 3.6 WATER SUPPLY ANALYSIS

- A. See attached report.

**WATER SUPPLY ANALYSIS TO BE PROVIDED WHEN  
TESTING AND REPORT IS PROVIDED**

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**WATER SUPPLY ANALYSIS FOR OGDEN SCHOOL DISTRICT  
HILLCREST ELEMENTARY SCHOOL**

November 17, 2023

This report contains an analysis of the water supply available for the Hillcrest Elementary School, at 130 North Eccles Ave Ogden, Utah. The Report is prepared at the direction of and under contract to:

Ken Crawford

Ogden School District  
Director of Purchasing  
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EXECUTIVE SUMMARY - The results of this Water Supply Analysis are summarized below as required on the Utah State Fire Marshal’s Office, Fire and Life Safety Plan Review Submittal Form (the following flow and pressure data comes from page 3 of 4 in this document):

**Water Supply Data:**

|   |  |                          |
|---|--|--------------------------|
| <b>Flow = 934 GPM</b>                   | <b>Static = 57 PSI</b>                           | <b>Residual = 51 PSI</b> |
| <b>Date of Test = November 17, 2023</b> | <b>Available Fire Flow at 20 PSI = 2,494 GPM</b> |                          |

INTRODUCTION – OGDEN SCHOOL DISTRICT is proposing constructing a building on their lot located 130 N Eccles Ave in Ogden, Utah.

Gardner Engineering has been retained to produce a water supply analysis for the subject project. The following is an analysis of the water supply, written with reference to the National Fire Protection Association’s 2013 Edition of its Standard for the Installation of Sprinkler Systems (NFPA 13 – 2013).

WATER SYSTEM DESCRIPTION - The portion of the Ogden City culinary water system providing water to the proposed site is gravity-fed and installed in a well-looped grid pattern. Refer to exhibit at the end of this document for a visual representation of the proposed facility, water system layout, and flow test reference points.

According to the Utah State Division of Drinking Water’s online records, the City has 73.2 million gallons (MG) of storage with an additional 2 million+ gallons proposed. The System receives its water from Pine View Res. Intake, Wheelers Creek Intake, multiple wells<sup>1</sup> and multiple consecutive connection with Utah WBWDC. The System is considered reliable.

<sup>1</sup> <https://waterlink.utah.gov/reports.html?systemId=1084> accessed 11/17/2023.

FLOW TEST—Please refer to the attached exhibit to see the approximate locations of hydrants and flow test data. The following information is prepared with numbered references to the NFPA 13 – 2013.

23.2.1 Water Supply Capacity Information (**per field test**).

- (1) Location and elevation of static and residual test gauge (Residual Hydrant) with relation to the estimated riser reference point in the new structure (RRP): Residual Hydrant is 1099` pipe feet northwest and 16` lower than the RRP.
- (2) Flow Hydrant (FH): ..... FH is 802 pipe feet northwest and 7` lower than the RRP
- (3) Static Pressure at Residual Hydrant, PSI ..... 67
- (4) Residual Pressure at Residual Hydrant, PSI ..... 60
- (5) Flow from Flow Hydrant, GPM<sup>2</sup> ..... 1,007
- (6) Date..... November 17, 2023
- (7) Time (24 hr clock)..... 0930
- (8) Name of persons who conducted the test ..... Riker Porter, (Gardner Engineering)  
..... Ron Dunn Ogden City
- (9) Other sources of water supply, with pressure or elevation ..... None

ANALYSIS—The following numbered information follows the outline given in NFPA 13 - 2013.

23.3.5.4 Supply Analysis (**per field test**)

- (1) Node tag at the source .....Residual Hydrant
- (2) Static pressure available at the source ..... 67 PSI
- (3) Residual pressure available at the source ..... 60 PSI
- (4) Total flow available at the source<sup>3</sup> .....2,816 GPM**

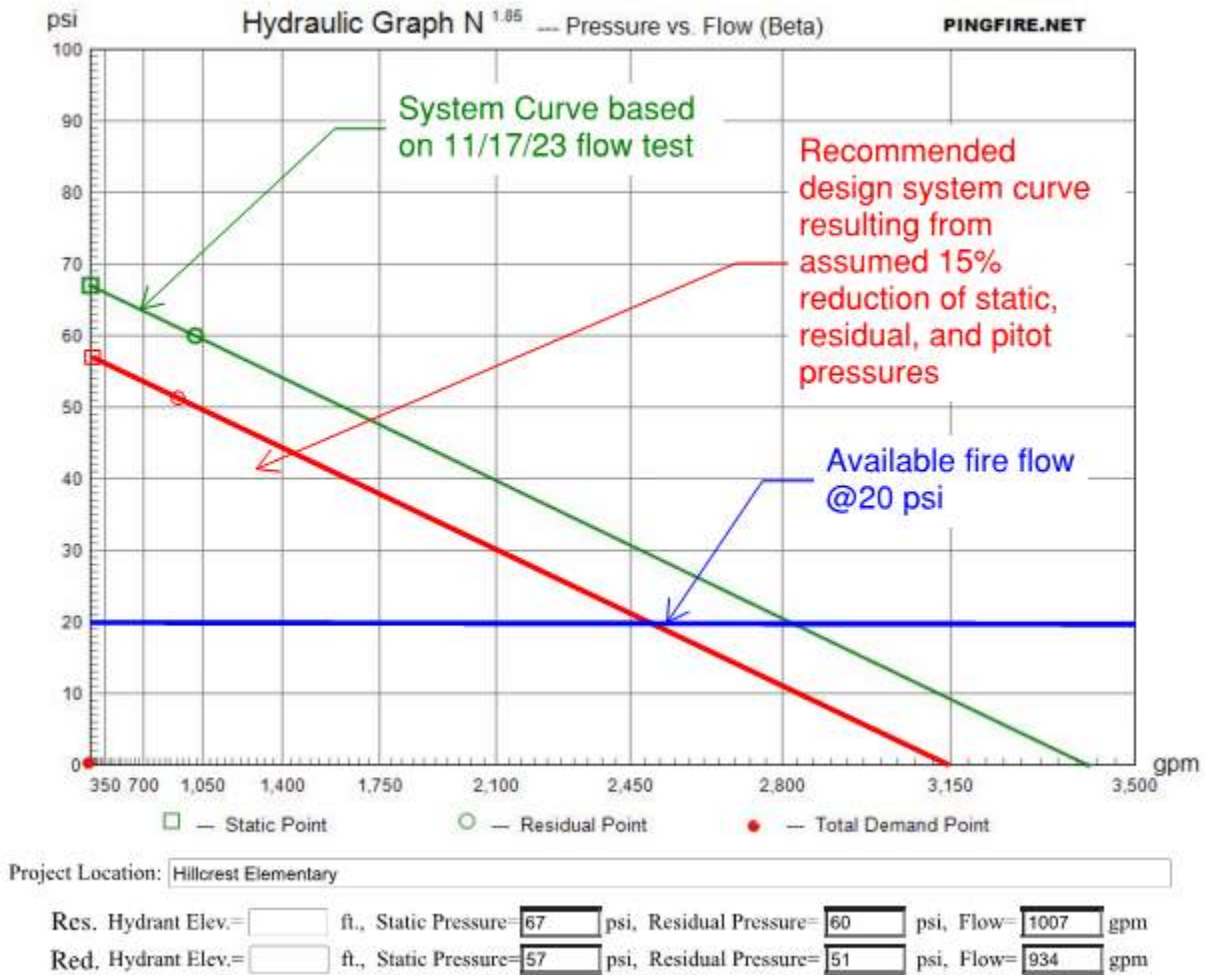
Per A.24.2.2.2 in NFPA13 – 2013, it is recommended that an adjustment be made to the flow test data to “account for daily and seasonal fluctuations...or...other condition that could affect the water supply”. Accordingly, the chart below was created to represent both the tested flow (green curve) and a 15% reduction in available pressure in the System (red curve) due to daily and seasonal demand patterns, as well as increased demands as the area builds out. The resulting table of flows and pressures given below this chart show the recommended design flow capacity at the site.

<sup>2</sup> Calculated using the Q formula:  $29.83 * c d^2 * (p)^{0.5}$ ; where c=0.9 nozzle coefficient, d=2.5” outlet diameter and p=pitot pressure (field-measured pitot pressure at FH = 36 PSI) = 1,007 GPM;

<sup>3</sup> Total flow available,  $Q_t$ , calculated using the equation  $Q_t = Q * (H_r^{0.54} / H_f^{0.54})$ ; where: Q = flow (1,007 GPM);  $H_r$  = (static pressure (67 PSI) less 20 psi);  $H_f$  = (static pressure (67 PSI) less residual pressure (60 PSI)).

### 23.3.5.3 Graph Sheet

The World's First Web-Based Hydraulic Graph N<sup>1.85</sup> for Water Supply and Demand Information



### 23.3.5.4 Supply Analysis (recommended design data: 15% reduction from flow test)

- (1) Node tag at the source .....Residual Hydrant
- (2) Static pressure available at the source ..... 57 PSI
- (3) Residual pressure available at the source ..... 51 PSI
- (4) Total flow available at the source<sup>4</sup> .....2,494 GPM**

#### CONCLUSION

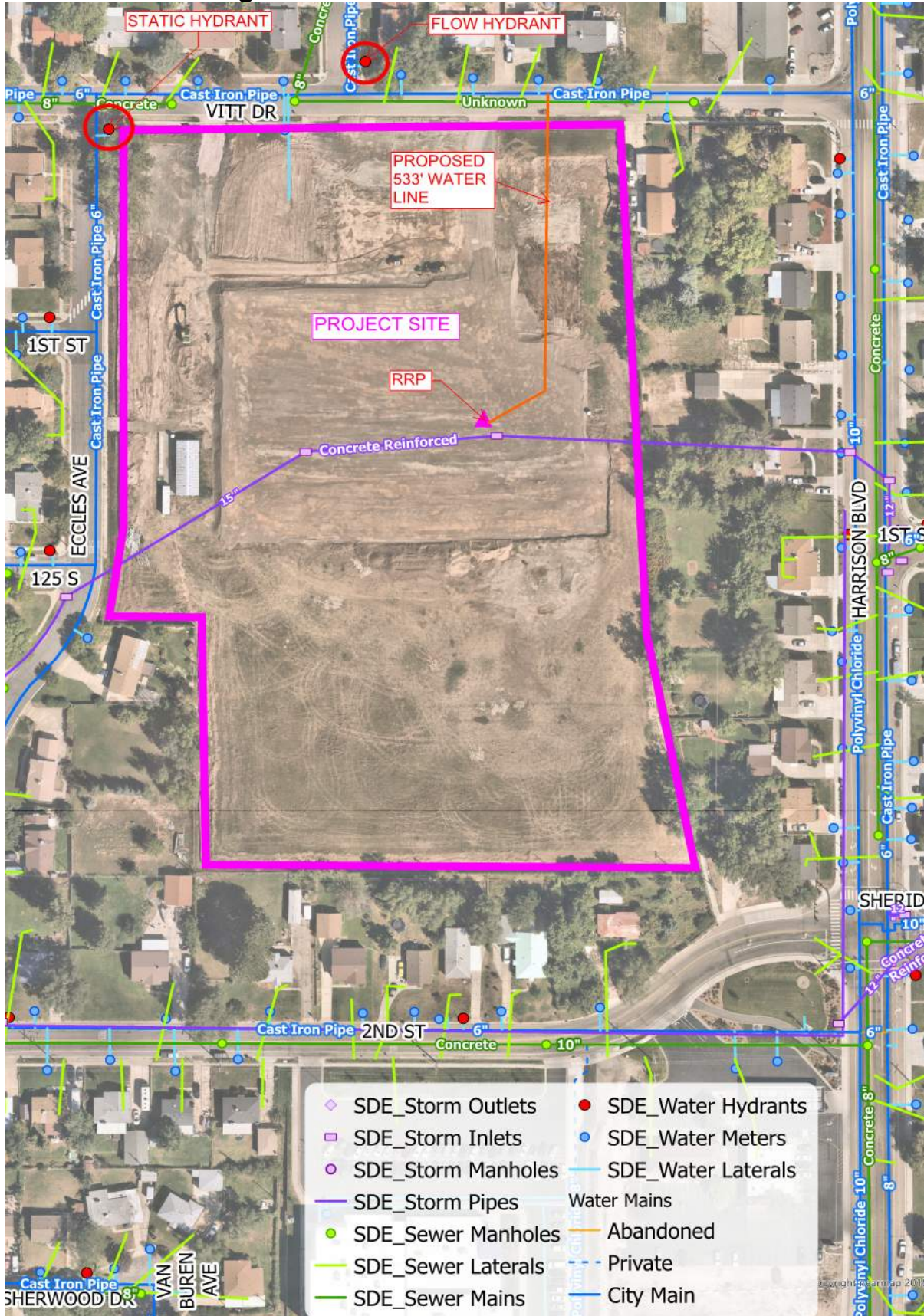
It is our opinion that it is reasonable to assume that a flow of at least 2,494 GPM will be available at the RRP throughout the year into the foreseeable future, absent a major catastrophic system event.

*End of Water Supply Analysis (Exhibit follows)*

<sup>4</sup> Total flow available,  $Q_t$ , calculated using the equation  $Q_t = Q * (H_r^{0.54} / H_s^{0.54})$ ; where:  $Q$  = flow (934 GPM – determined from reduced pitot pressure);  $H_r$  = (static pressure (57 PSI) less 20 psi);  $H_s$  = (static pressure (57 PSI) less residual pressure (51 PSI)).



**Figure 1 – HILLCREST ELEMENTARY**



## SECTION 22 0000

### PLUMBING

#### PART 1 – GENERAL

##### 1.1 SCOPE OF WORK

- A. Piping diagrams are schematic and indicate preferred pipe routing. It is the intent that the installation be complete. Where fixtures are not shown connected to any required services, they shall be connected properly and completely. Connect all fixtures to various services, i.e., hot water, cold water, waste, and vent, etc., as required.
- B. The work shall include furnishing of all materials and labor required for the job as described, together with all accessories and trim implied or required to finish the work, and generally as follows:
  - 1. Complete rain removal system, including piping and roof drains.
  - 2. Plumbing fixtures and piping.
  - 3. Water Heaters.
  - 4. Water softeners.
  - 5. Sanitary sewer systems.
  - 6. Grease interceptor and sampling manhole
  - 7. Natural gas systems
  - 8. Backflow prevention systems.
  - 9. Condensate drain systems.
  - 10. Water to AHU evaporative sections.
  - 11. Kitchen equipment connections.
  - 12. Final connection of building systems to site utilities.

1.2 **See specifications section 230100-10.3.3.E & 230100-10.3.3.F for factory training requirements.**

##### 1.3 STANDARDS

- A. Plumbing installation shall be made in accordance with the 2021 International Plumbing Code, City Code, and all other governing codes.
- B. In the event drawings violate the codes as being locally enforced, the contractor shall base his estimate on the enforced code requirements.

##### 1.4 DISINFECTING

- A. After flushing the mains, introduce a water and chlorine solution concentrated to 300 PPM to disinfect the system and oxidize piping contaminates. Retain treated water and chlorine for a period of not less than three hours or more than six hours before final flushing out of system.
- B. All valves should be opened periodically during the process and the residual chlorine checked to ensure that at least 50 percent of the initial concentration is present to complete the disinfection. If there is less than 50 percent, the valves should be allowed to drain water until the 50 percent or greater level is obtained. A make-up chlorine solution of a concentration equal to the initial concentration must be added as needed during the withdrawal of the spent solution.

- C. A warning sign shall be conspicuously posted at each water outlet and faucet during the disinfecting process to prevent occupants from drinking the water.

Flushing: Following disinfection, all treated water shall be flushed from the system through its extremities. Flushing shall continue until samples show that the quality of the water delivered is comparable with the quality of the public water supply and satisfactory to the public health authority having jurisdiction. Flushing shall be repeated if samples taken daily over a period of three days show the water quality is not being maintained. Samples shall be taken only from taps located and installed in such a manner that they will not contribute any contamination. Samples shall not be drawn from hydrants or through unsterilized hose. Test samples shall be certified by a recognized and approved testing laboratory, and a certificate of acceptability shall be submitted.

- D. Written certification of the disinfecting process and purity of water samples shall be forwarded to the Owner's representative.

## 1.5 VERIFICATION OF GRADE

- A. The contractor shall verify with the site utilities contractor the connection of water, and waste piping systems to the mains, and shall verify the actual job site elevation and location prior to the installation of the building footings.

## PART 2 – PRODUCTS

### 2.1 CLEANOUTS

- A. Approved cleanouts shall be installed in the base of each vertical drainage line, and in the horizontal line at each change in direction. In addition, there shall be cleanouts spaced at a maximum of 50' in all horizontal lines. All cleanouts shall be extended to accessible surfaces. All cleanouts to grade shall be capable of cleaning in both directions.

### 2.2 WATER HAMMER

- A. Provide and install stainless steel bellows type shock absorbers in the ends of all multiple fixture water lines and in piping ahead of snap-acting automatic valves.
- B. Absorbers shall be sized and located in compliance with manufacturer's recommendations for the specific application. Absorbers shall be Zurn, Wade, or Smith.
- C. Absorbers shall not be installed in inaccessible areas. Extend piping to accessible locations.

### 2.3 FLASHINGS

- A. All pipes passing thru the roof shall be neatly flashed. Flashing shall be provided under Division 7.

### 2.4 FIXTURE STOPS

- A. All stops for plumbing fixtures shall be McDonald 1/4 turn ball valves.

### 2.5 PLUMBING FIXTURES

- A. This contractor shall furnish and install all fixtures shown on the architectural or mechanical drawings or specified hereinafter, clean and adjust all fixtures and replace any damaged fixtures at the contractor's expense.

B. The fixtures shall be all new and complete as shown and described in manufacturer's catalog, and as required for the work, including accessible loose key 1/4 turn ball valve stops above the floor in supplies to all fixtures, and cast brass P-traps, unless otherwise shown. Trim for all fixtures shall be chrome-plated, and all trim shall match in design. Supply faucets shall have renewable seats and barrels.

C. Approved Fixtures:

|                                     |   |
|-------------------------------------|---|
| Water closets, urinal & lavatories: | Kohler, American Standard, or approved equal.         |
| Flush valves:                       | Zurn, Sloan, or approved equal.                       |
| Sinks:                              | Just, Elkay, or approved equal.                       |
| Faucets:                            | Moen, or approved equal                               |
| Drinking fountains:                 | Elkay, or approved equal.                             |
| Shower trim:                        | Symmons, Bradley, T&S Brass, Moen, or approved equal. |
| Hose bibbs:                         | Watts, Zurn, JR Smith, Woodford, or approved equal.   |
| Emergency fixtures:                 | Bradley, Symmons, Haws, or approved equal.            |
| Tempering valves:                   | Bradley, Symmons, Watts, or approved equal.           |
| Floor drains, floor sinks:          | Zurn, JR Smith, Watts, Josam, or approved equal.      |
| Trench drains:                      | Polydrain, Josam, Zurn, or approved equal.            |
| Roof drains, downspouts:            | Zurn, Watts, AO Smith, or approved equal.             |

PLUMBING FIXTURES

|      |                        |  |
|------|------------------------|--|
| WC-1 | Water Closet:          | Kohler K-4330 'Kingston' siphon jet, wall hung, elongated bowl, 1-1/2" top spud; Zurn sensor 1.6 ZER6200-CPM battery powered flush valve.6 gpf chrome plated flush valve; K-666C 'Bemis 1955C extra heavy solid plastic white open front seat with stainless steel self-sustaining check hinge; Wade W-311 (horizontal) or W-331 (vertical) series carrier, single or double right or left as required, with foot support. |
| WC-2 | Water Closet:<br>(ADA) | Same as "WC-1" - Set at handicapped height.  |

|     |                           |  |
|-----|---------------------------|--|
| U-1 | Urinal:                   | Kohler #K-4960ET "Barton" vitreous china, wall hung, siphon jet with flushing rim, 2" outlet connection, 1-1/4" top spud with Moen #8314 battery powered sensor operated chrome plated flush valve with vacuum breaker and battery, plate type carrier and bearing plate. Wade W-452, Zurn 1222, Smith 633.  |
| U-2 | Urinal:<br>(ADA)          | Same as U-1 set at handicapped height.   |
| L-1 | Lavatory:<br>(ADA)        | Kohler K-2032 "Greenwich" 20" x 18" - 4" center set vitreous china, front overflow, anti-splash rim, center basin, wall hanger, punched for concealed arm carrier, Moen 8886 2-handle ADA metering faucet with grid strainer. Tailpiece and flexible supplies w/stops and brass P-trap. Provide Watts USG-B ASSE 1070 thermostatic mixing valve and ADA insulation kit. Support lavatory with Zurn ZN1231 concealed arm carrier with foot support. |
| L-2 | Lavatory:                 | Sloan DSG-83000 "Corian/Silestone" gradient integrated sink system: 90"x 22" x 5" ADA compliant 3-station wall mounted with factory battery powered sensor activated .5 gpm (3) EBF-415 faucets, strainer & drain assembly. Provide factory dual check valves, ASSE tempering valves, stainless steel vandal resistant access panel & all accessories for a complete system.   |
| S1L | Sink:<br>(Kindergarten)   | Just CRB-2022-A-GR 22" x 19.5" x 6-1/2" D, 18 ga., 304 stainless steel, drilled for 3-hole rear ledge center set faucet and left ledge bubbler. Bubbler punch/pin must be off-set to position bubbler over sink basin, self-rimming, sound dampening, cup strainer, Moen #8248 rigid faucet with 4" wrist blade handles, aerator, flexible supplies, brass P-trap, and Haws 5017LF bubbler.  |
| S1R | Sink:<br>(Kindergarten)   | Just CRB-2022-A-GR 22" x 19" x 6-1/2" D, 18 ga., 304 stainless steel, drilled for 3-hole rear ledge center set faucet and right ledge bubbler. Bubbler punch/pin must be off-set to position bubbler over sink basin, self-rimming, sound dampening, cup strainer, Moen #8248 rigid faucet with 4" wrist blade handles, aerator, flexible supplies, brass P-trap, and Haws 5017LF bubbler.   |
| S-2 | Sink:<br>(Wellness 1113)  | Just SL-1921-A-GR 19" x 21" x 7 1/2" D, 18-gauge, 304 stainless steel, drilled for 3-hole center set faucet, self-rimming, sound dampening, cup strainer, Moen #8248 rigid faucet with yoke, 4" wrist blade handles, and aerator, flexible supplies, brass P-trap.   |
| S-3 | Sink:<br>(Faculty 1111)   | Just SL-1921-A-GR 19" x 21" x 7 1/2" D, 18-gauge, 304 stainless steel, drilled for 3-hole center set faucet, self-rimming, sound dampening, cup strainer, Moen #8248 rigid faucet with yoke, 4" wrist blade handles, and aerator, flexible supplies, brass P-trap.   |
| S-4 | Sink:<br>(Nurse 1108)     | Just SL-1921-A-GR 19" x 21" x 7 1/2" D, 18-gauge, 304 stainless steel, drilled for 3-hole center set faucet, self-rimming, sound dampening, cup strainer, Moen #8248 rigid faucet with yoke, 4" wrist blade handles, and aerator, flexible supplies, brass P-trap.   |
| S-5 | Sink:<br>(STEAM Lab 1336) | Just SLX-2133-A-J 31" x 22" x 10-1/8" D, 18-gauge, 304 stainless steel, drilled for 3-hole center set faucet, self-rimming, sound dampening, cup strainer, Moen #8248 rigid faucet with yoke, 4" wrist blade handles, and aerator, flexible supplies, brass P-trap.  |

|       |  |  |
|-------|--|--|
| S-6   | Sink:<br>(Collaboration)<br>(Workroom) | Just CRB-2022-A-GR 22" x 19" x 6-1/2" D, 18 ga., 304 stainless steel, drilled for 3-hole rear ledge center set faucet, self-rimming, sound dampening, cup strainer, Moen #8248 rigid faucet with 4" wrist blade handles, aerator, flexible supplies, brass P-trap.   |
| S-7   | Sink:<br>(STEAM Lab 1426)              | Just JH-ADA-4820-S-CP, 16-gauge wall mount type 304 stainless steel, with wall bracket, JSL sensor faucet, JTMLF-47 mechanical mixing valve, Proflo PF8912 cast P-trap, Proflo 210PC tailpiece and grid strainer.  |
| SS-1  | Service Sink:<br>(Floor type)          | Kohler K-6710 "Whitby" 28" x 28" service sink, floor mounted, drain channels; Moen 8124 polished chrome faucet with vacuum breaker, hose end with hose, bucket hook, wall brace integral stops and rough chrome finish. Faucet to be mounted 30" above finish floor; K-8940 rim guard; K-9146 drain with strainer for 3" connection.   |
| DF-1  | Drinking Fountain:                     | Elkay LZSTL8WSSK bi-level, wheelchair access, double bowl, wall mounted, air cooled, refrigerated type with bottle filler to cool 8 gal/hr. from 80 deg. F. to 50 deg. F. with 90 deg. F. EAT. 1/5 HP hermetic compressor, 120/1/60. 304 stainless steel top w/chrome plated bubbler and 'Light Touch' wrap around self-closing press bar operable from front of fountain.<br><u>Mount bottle filler at high side of dual level fountain.</u><br>Cabinet color shall be stainless steel #4 satin finish. Note: Cut electrical cord at time of installation to suit electrical outlet provided. |
| SH-1  | Shower: (ADA)                          | Bradley Model 1C-EF-SF-AKV-LBJ-15 single lever compression shower valve with volume control and adjustable temperature limit. Shower shall have shower head w/ ball joint and shower arm with wall flange. Handheld 60" SS hose w/spray head, Bradley Model DV diverting valve and vacuum breaker. All items shall be set to handicapped heights & comply with standards of the Utah State Physical Handicapped Code.  |
| WB-1  | Washer Box:                            | Guy Gray WB-200 "Duo-Cloz" for on-the-wall installation with concealed piping, dual 1/2" ball valves with single level on-off control and hose connections. Rough chrome plate finish. (Verify mounting height with existing conditions). Provide 1-1/2" standpipe drain with P-trap for waste connection.   |
| IMB-1 | Ice Maker Box:                         | Guy Gray BIM-875 for in-the-wall installation with concealed piping, 1/2" ball valve. 18-gauge dipped galv. steel finish. Face plate with 20-gauge box. (Verify mounting height with conditions).  |
| HB-1  | Hose Bibb:                             | Woodford model B65 non-freeze anti-siphon wall hydrant with brass casing and plain brass face, provide brass locking box with loose key and set screw with water stamped on door for each hydrant. 18" minimum length.<br>Hydrant box to be sized for block coursing. Center HB-1 in block course.   |
| HB-2  | Hose Bibb:                             | Woodford model B65 non-freeze anti-siphon wall hydrant with brass casing and plain brass face, provide brass locking box with loose key and set screw with water stamped on door for each hydrant. Hydrant box to be sized for block coursing. Center HB-1 in block course.  |
| HB-3  | Hose Bibb:                             | Woodford model 24 3/4" sill faucet with 3/4" hose thread outlet with removable tee handle, chrome-plated, with wall flange and vacuum breaker.   |

|      |  |  |
|------|--|--|
| HB-4 | Hose Bibb:                                       | Chicago Faucet No. 952 (No. 998 where connected to exposed piping) 3/4" chrome plated hose bibb with No. 293-6 handle and 3/4" threaded outlet with integral vacuum breaker. Mount at 60" AFF.   |
| TP-1 | Trap Primer:                                     | PPP Inc. Model MPB-500 electronic trap primer, 1/2" inlet and outlet, 1" air gap fitting, solenoid valve and timer with override button, 120/1/60. Unit assembly shall be complete in NEMA #1 metal box with access door. Provide distribution manifolds as required.  |
| EW-1 | Emergency Eyewash:<br>(Wall mounted boiler room) | Haws Model 7360B, Barrier free, wall mounted stainless steel receptor, dual spray heads, valve with lever, stream control, dust cover and wall bracket.  |
| HR-1 | Hose Reel:                                       | Lincoln 877554W hose reel. Reel shall be rated for 30 deg. F. cold and 110 deg. F. hot water. Reel to be c/w heavy duty wall bracket, 50'-0" delivery hose with hose ends, connecting hose, ball stop, and 846 bibb cock. Provide a Moen faucet No. 8230 rough chrome faucet with vacuum breaker and hose end. Mount entire assembly at 60" A.F.F.   |
| TV-1 | Tempering Valve:                                 | Watts series USG-8 (ASSE 1070) tempering valve, 3/8" inlets and 3/8" outlet, to mix cold water with 120 deg. F. hot water for 110 deg. F. tempered water supply. 0.50 GPM min. flow and 1 GPM at 10 psi pressure drop. Tempering valve shall be complete with check stops, bronze body, and adjustment cap with locking feature. Valve shall be installed as high as possible below sink or lav. |
| TV-2 | Tempering Valve:<br>(Emergency Eyewash)          | Leonard Model TA-300-RF emergency mixing valve, 1/2" inlets and 1/2" outlet, to mix cold water with 120 deg. F. hot water for 85 deg. F. tempered water supply. 0.5 GPM min. flow and 6 GPM at 20 psi pressure drop. Manifold shall be complete with temperature gauge, inlet check stops, and cold-water bypass.  |
| FD-1 | Floor Drain:                                     | Zurn #Z-415-4 2" cast iron drain with nickel bronze round top. Drain to have deep seal P-trap. Provide Pro Vent systems Proset trap guard in all FD-1 floor drains.  |
| FD-2 | Floor Drain:                                     | Zurn Z-521 3" heavy duty drain with slotted stainless-steel sediment bucket, loose grate, dura-coated cast iron body, "Duresist" grate, and deep seal trap & ASSE trap guard.  |
| SD-1 | Shower Drain:                                    | Zurn #Z-415-4 2" cast iron drain with chrome-plated bronze square top. Drain to have deep seal P-trap. Provide Pro Vent systems Proset trap guard in all SD-1 shower drains.   |
| TD-1 | Trench Drain:                                    | Polycast Series 600 precast polymer concrete pre-sloped drain system with #DG0641 cast iron grating and #DG0642B grating hold-down devices. Drain shall be drilled for 3" outlet with deep seal trap. See plan for length.   |
| F-1  | Filter:  | Drain Net GDR-A6. 20.5" L x 12" W x 10" H. Provide optional extension legs as required for installation. To be complete with removable tray. Filter & tray to be 100% stainless steel construction.  |

- FS-1 Floor Sink: Zurn ZN-1900-2" sanitor floor sink with 12" x 12" square top, full removable grate with center opening. N.B. dome, sani-coated exterior, acid resistant enamel interior, and Z-100 deep seal trap. Sink shall be complete with full grate, 3/4 grate, 1/2 grate, etc. as necessary to match application. Sink to be installed flush with floor.
- FS-2 Floor Sink: Zurn ZN-1900-3" sanitor floor sink with 12" x 12" square top, full removable grate with center opening. N.B. dome, sani-coated exterior, acid resistant enamel interior, and Z-100 deep seal trap. Sink shall be complete with full grate, 3/4 grate, 1/2 grate, etc. as necessary to match application. Sink to be installed flush with floor.
- FS-3 Floor Sink: Zurn ZN-1900-4" sanitor floor sink with 12" x 12" square top, full removable grate with center opening. N.B. dome, sani-coated exterior, acid resistant enamel interior, and Z-100 deep seal trap. Sink shall be complete with full grate, 3/4 grate, 1/2 grate, etc. as necessary to match application. Sink to be installed flush with floor.
- HD-1 Hopper Drain: Zurn #Z662 4" diameter 16" x 16" dura coated C.I. hopper drain with grate. Provide deep seal P-trap.
- RD-1 Roof Drain: J. R. Smith #1010-ARC. Roof drains shall be cast iron type with flashing collar, C.I. dome, gravel guard, sump receiver, and underdeck clamp. See plans for sizes.
- RD-2 Roof Drain:  
(Secondary) J. R. Smith #1080-ARC w/2" water dam, duco cast iron body with combined flashing clamp and gravel stop with underdeck clamp, sump receiver, and cast-iron dome. See plans for sizes.
- DN-1 Downspout Nozzle: Smith #1770 brass downspout nozzle. Provide 1/4" mesh aluminized, slip-fit bird screen. See plans for sizes.
- GI-1 Grease Interceptor: Furnish and install the 1000 gallon two-cell grease interceptor shown on the drawings. Interceptor shall conform to 2015 International Plumbing Code requirements and local sewer district requirements, including latest revisions. Pre-cast reinforced concrete walls shall be poured continuous with floor. Provide heavy steel manhole covers on inlet and outlet basins for service and maintenance. Frames and cover to be treated with a corrosion resistant coating.
- SM-1 Sampling Manhole: Precast concrete manhole with dimensions shown on plans. See plans for waste connections size. Manhole shall conform to 2015 International Plumbing Code requirements and local sewer district requirements, including latest revisions.



2.6 WATER HEATER: (WH-1 & WH-2)

- A. Water heater shall be natural gas fired, high efficiency w/ AGA approved gas train. 199,000 BTUH input with 247 GPH recovery thru 90 deg. F. temp. 3" PVC vent and air intake with factory roof termination kit. 100-gallon glass lined ASME:"H" stamp vertical storage tank with pressure and temperature relief valve, insulated jacket with baked enamel finish, complete with all controls for automatic operation. Heater shall be designed for 140 deg. F. operation. 120/1/60 15 amp power.

Make & Model: Bradford White EF-100T-199E or A. O. Smith or Rheem equivalent  
Nominal Size: 28-1/4" Dia. x 77-5/8" H.  
Shipping Weight: 900 lbs.

2.7 WATER HEATER: (WH-3)

- A. Water heater shall be natural gas fired, high efficiency w/ AGA approved gas train. 199,000 BTUH input with 558 GPH recovery thru 40 deg. F. temp. 3" PVC vent and air intake with factory roof termination kit. 100-gallon glass lined ASME:"H" stamp vertical storage tank with pressure and temperature relief valve, insulated jacket with baked enamel finish, complete with all controls for automatic operation. Heater shall be designed for 140 deg. F. operation. 120/1/60 15 amp power.

Make & Model: Bradford White EF-100T-199E or A. O. Smith or Rheem equivalent  
Nominal Size: 28-1/4" Dia. x 77-5/8" H.  
Shipping Weight: 900 lbs.

2.8 WATER SOFTENER: (WS-1)

A. SCOPE:

1. Provide as indicated a vertical pressure type water softening system complete with pressure vessel, control valve, softening resin and combination brine salt storage tank. The system shall be of an approved design fabricated by a manufacturer regularly engaged in the production of water treatment equipment. All equipment and material will be supplied in compliance with the specifications as intended for a complete and operational system.

B. GENERAL DESCRIPTION:

1. This system shall be a simplex (single) meter water softening system designed to remove mineral hardness from a known water source. The system will be capable of supplying 4,800 gallons of softened water between regenerations based on the influent total water listed in the Design Parameters.

C. DESIGN PARAMETERS:

|                                      |  |
|--------------------------------------|--|
| Influent Total Water Hardness        | 20 grains per gallon (gpg)                     |
| Influent Total Water Hardness        | 342 parts per million (ppm) or mg/l            |
| Normal System Flow & Pressure Drop:  | 47 gpm @ 15 psi drop                           |
| Maximum System Flow & Pressure Drop: | 60 gpm @ 25 psi drop                           |
| Backwash/Rinse Flow:                 | 5.3 gpm  |
| Operating Temperature Range:         | 40°–100°F                                      |
| Operating Pressure Range (System):   | 30–120 psi                                     |
| Electrical Requirements:             | 120 Volt, 60 Hz, 1 phase (receptacle required) |

D. EQUIPMENT SPECIFICATIONS:

1. Mineral Tanks:

- a. Each mineral tank shall be 16 inches in diameter. The height shall be 65 inches, sufficient to allow for proper freeboard space above the resin bed for adequate expansion of the resin during backwashing.

2. Mineral Tank Construction:

- a. Mineral tanks shall be ASME fiberglass type tank. The tank shall be rated for 150 psi maximum working pressure.

3. Internal Distribution:

- a. The upper distribution system in each softener shall be of the basket diffuser type to dispense water laterally to avoid channeling within the resin bed.
- b. The lower distribution system shall be of the hub and lateral distributor type, constructed of noncorrosive materials and shall be designed to provide even flow distribution through the resin bed. The lower distribution system shall be embedded in a subfill of washed gravel to support the resin bed.

4. Main Operating Valves:

- a. The main operating control valves shall be of a top mount design constructed of lead-free brass with 2.0-inch NPT inlet and outlet piping connections. The control valves shall operate using a hydraulically balanced piston, driven between a series of seals and spacers to actuate the various regeneration cycles. The control valves shall incorporate self-adjusting flow regulators to control the rate of flow to the drain and prevent resin loss during backwash regardless of system pressure fluctuations between 30 and 120 psi. The system shall be supplied with an alternating valve to control the on-line and off-line status of each unit as well as preventing hard water bypass during regeneration.

5. Control Valve Timers:

- a. Each control valve shall be equipped with an electronic programmable regeneration controller that will accept pulses from the electronic water meter and initiate a regeneration cycle after the preset gallons have been used. The controller will control the overall operation of the water softening system. All cycle times shall be fully adjustable. The order of the regeneration cycles shall be adjustable as well as the ability to add or delete cycles from the regeneration program. The controller shall be capable of displaying the following information: The current system flow rate, peak flow rate, gallon totalizer, days since last regeneration, total days since start-up, number of regenerations since start-up and a 63-day water usage history.

6. Water Meter:

- a. The meter body shall be constructed of stainless steel with 2.0" NPT pipe connections. It will be designed to allow ease of removal of the turbine for inspection without modification of the piping system.

7. Exchange Resin:

- a. The ion exchange resin shall be virgin high capacity "standard mesh" and shall be stable over the entire pH range with good resistance to bead fracture from attrition or osmotic shock. Each cubic foot of resin will be capable of removing 30,000 grains of hardness as calcium carbonate when regenerated with 15 lbs. of salt. The resin shall be solid, of proper particle size, (not more than 4% through 40 mesh U.S. standard screens, wet screening) and will contain no agglomerates, shells, plates, or other shapes that might interfere with the normal function of the water softener.
- b. The system shall include a total of 4 cubic feet of ion exchange resin.

8. Brine System:

- a. Provide a complete brine system consisting of a plastic tank, salt platform, brine well, an automatic brine valve and all necessary fittings for operation with the water softening system. The system shall consist of a combination brine measuring and salt storage tank with salt platform. The tank will be 24 inches in diameter x 41 inches in height. The brine tank will be equipped with a float operated non-corrosive field serviceable brine float valve for automatic control of brine withdrawal and freshwater refill.

9. Accessories:

- a. Water test kits for hardness tests.
- b. Pressure Gauges for hard water inlet and soft water outlet.
- c. Sampling Cocks for hard water inlet and soft water outlet.
- d. Vacuum Breaker for protecting Fiberglass tanks from vacuum.

10. Instructions and "Start Up":

- a. A complete set of operating instructions covering the installation, maintenance and operation of the water softener system shall be furnished bound in booklet form. The installing contractor shall provide for the service of a supervising agent to inspect the completed installation, start the water softening system in operation, and acquaint the operators with the proper operation and maintenance of the equipment.

11. Guarantee:

- a. Any mechanical equipment proving defective in workmanship or materials within one (1) year after installation shall be replaced F.O.B. factory, and under actual operating conditions, the effluent shall contain zero GPG hardness as determined by soap test, that the loss of ion exchange resin through attrition during the first three (3) years of operation shall not exceed three (3) percent per year; that the resin shall not be washed out of the system during the service run or backwashing period; that the turbidity and color of the effluent, by reason of passing through the softener system, shall not be greater than the incoming water.
- b. Softener unit system shall be Pacific, Columbia, or approved equal.

## 2.9 LEAD PANS AND WATERPROOF MEMBRANES

- A. Furnish a 30" square 4# lead flashing with each roof drain.
- B. All floor drains shall be fitted with clamping collar and waterproof membrane.
- C. Membrane and lead waterproofing pans for shower stalls and built-up type custodial floor sinks shall be furnished and installed by plumbers so they are 100% watertight. Drains shall have clamping device which clamps drain to pans. There shall be a mastic seal between floor drain bottom and lead or membrane so when clamping device is tightened, there is a complete watertight seal.
- D. Care should be taken not to clog weep holes. All pans will be tested by placing test plug in drain and filling with water overnight.

## 2.10 KITCHEN EQUIPMENT

- A. The plumbing contractor shall rough-in and make final connection to all kitchen equipment as noted on the drawings and/or as required by the equipment and manufacturer for a complete and operable installation.
- B. Data shown on the drawings is for design equipment. This contractor will, prior to construction, be issued a kitchen equipment booklet of equipment being installed, and all rough-in and connection data shall be taken from this booklet.
- C. This contractor shall provide all necessary valves, stops, unions, piping, etc. for a complete installation.
- D. The refrigeration system for the kitchen refrigerator and freezer will be provided by the kitchen equipment supplier.
- E. The plumbing contractor shall review the kitchen equipment drawings and specifications for miscellaneous items which are to be furnished and/or installed under the plumbing division of the work.

## 2.11 CONDENSATE DRAIN

- A. All refrigerated air conditioning and/or cold storage cases which have cooling coil condensate drip pans with pipe connections shall be piped to the nearest drain by this contractor.
- B. Pipe location and routing shall be approved by the owner's representative.
- C. Piping shall be the same size as the drain pan connection and shall be trapped to prevent forced air flow thru the pipe.

## 2.12 VACUUM BREAKERS, DOUBLE CHECK VALVE ASSEMBLIES, & BACKFLOW PREVENTERS

- A. Vacuum breakers and backflow preventers shall comply with the requirements of the Utah State Plumbing Code and 2021 IPC for the actual installed duty.
- B. Vacuum breakers and backflow preventers shall be of the type, style, and arrangement approved by the Code.
- C. All vacuum breakers and backflow preventers shall be installed with the necessary isolation valves and test cocks.

- D. Backflow preventers shall be located at a maximum of 4' - 0" A.F.F. and shall be accessible for service. Backflow preventers shall have a water filter with a replaceable cartridge.

#### 2.13 GAS PRESSURE REGULATORS

- A. Furnish and install, as required, approved type gas pressure regulators in gas piping ahead of appliance and equipment. Regulators located outside of the building shall have weatherproof vent with bugproof screen. Regulators located inside of the building shall be vented to the outside with approved cap screen. Approved manufacturers of gas regulators are Fisher and Reliance.

#### 2.14 SEISMIC GAS SHUT-OFF VALVE

- A. Valve shall be seismically activated type with positive shut-off seal and automatic non-creeping mechanism with manual reset and visual open-close indicator.
- B. Valve shall be U.L. listed for natural gas use and meet Standards for Earthquake Activated Automatic Gas Shut-off Systems, Standard No. 12-23-1, and ANSI Z21.70 1981.
- C. Shut-off shall activate within five seconds when subjected to a horizontal sinusoidal oscillation having a peak acceleration of 0.3 G and a period of 0.4 seconds.
- D. Positive seal shall be provided from -10 deg. F. to +150 deg. F. at 20 psi gas pressure.
- E. Seismic shut-off valve shall be Koso Model 2" 3/4 HP or approved equal.

#### 2.15 CIRCULATORS

- A. Furnish and install the circulators shown and specified on the drawings. Circulators shall be of the in-line, pipe-mounted, motor driven, centrifugal type. All motors shall operate at 1750 RPM. Circulators shall operate at high efficiency and shall have a quiet, vibrationless operation. Provide steel support for motor. All circulators to be all bronze construction.
- B. Circulators shall be Bell & Gossett, Armstrong or Taco.

### PART 3 – EXECUTION

#### 3.1 PRODUCT HANDLING

- A. Protection:
  - 1. Use all means necessary to protect plumbing materials before, during, and after installation and to protect the installed work and materials of all other trades.
- B. Replacements:
  - 1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner and at no additional cost to the Owner.

#### 3.2 TESTING

- A. Furnish all required personnel and equipment and make all tests required to receive the approval of the Owner and all agencies having jurisdiction.

### 3.3 CLEANING UP

- A. Prior to acceptance of the building, thoroughly clean all exposed portions of the plumbing installation, removing all labels and all traces of foreign substance, using only a cleaning solution approved by the manufacturer of the plumbing item and being careful to avoid all damage to finished surfaces.

### 3.4 ROOF DRAIN LOCATIONS

- A. This contractor shall review the architectural and structural drawings, and shall field verify from actual job site conditions that the roof drains are located at the low points of the roof systems. The locations shown on the plumbing drawings are approximate. All low points on the roof shall have primary and secondary roof drains installed in them unless otherwise noted.

### 3.5 WATER CLOSET INSTALLATION

- A. General: Install water closets as shown on the drawing and as follows:
  - 1. Supply pipe extending from wall shall be covered by chrome plated sleeve and wall flange.
  - 2. Additional wall plates shall be provided where each pipe extends through finished wall.
  - 3. Two rubber or plastic seat bumpers with metal holders shall be provided and secured to the wainscot behind the fixture.
  - 4. The centerline of the flush valve shall be on the centerline of the fixture, 39 inches above the finished floor and a minimum of 2-1/4 inches from the wall.
  - 5. Chrome plated pipe support shall be provided on the long flush pipe outlet and shall be secured rigidly to the wall with suitable anchors.
  - 6. The backflow preventer for the flush valve shall be installed at the discharge of the valves.
  - 7. The flush valve water piping concealed in the partition shall be rigidly supported; piping between flush valve and wall shall be provided with a factory fabricated chromium plated spacer sleeve and wall flange.

### 3.6 LAVATORY INSTALLATION

- A. General: Install lavatories as shown on the drawings and as follows:
  - 1. Lavatories for use by wheelchair handicapped shall be installed with a minimum rim height of 34", a minimum vertical clearance of 29" from floor, and a minimum clear knee recess of 30" in width and 20" in depth.
  - 2. Trap on lavatory for use by wheelchair handicapped shall be installed so as to provide maximum clearance under bowl. Exposed waste, trap and hot water supply under lavatory shall be insulated in accordance with the requirements for domestic hot water piping.
  - 3. All lavatories shall be installed with a rim height of 34".

### 3.7 URINAL INSTALLATION

- A. General: Install urinals as shown on the drawing and as follows:
  - 1. Supply pipe extending from wall shall be covered by chrome plated sleeve and wall flange.
  - 2. Additional wall plates shall be provided where each pipe extends through finished wall.
  - 3. The centerline of the flush valve for wall hung urinals shall be on the centerline of the fixture, 45 inches above the finished floor and a minimum of 2-1/4 inches from the wall.
  - 4. The centerline of the flush valve for handicap urinals shall be 40 inches or less above the finished floor.
  - 5. The backflow preventer for flush valve shall be installed at the discharge of the valve.

6. The flush valve and the water piping concealed in the partition shall be rigidly supported; piping between flush valve and wall shall be provided with a factory fabricated chromium-plated spacer sleeve and wall flange.

### 3.8 FIXTURE CONNECTIONS

- A. Floor Mounted Water Closets and Service Sinks: Provide connections between soil pipes and floor connected water closets and service sinks made with cast-iron floor flanges.
- B. Connection sizes shall be 4-inch for water closets and 3-inch for service sinks.
- C. Floor flanges shall be slipped over the ends of the pipes and caulked in position.
- D. Special short radius fittings shall be used where space does not permit the use of standard fittings below the flanges.
- E. Setting Compounds and Gaskets: Provide watertight and gas tight seals between flanges and fixtures with plumbing-fixture-setting compound or manufacturer's standard non-asbestos gaskets.
- F. Neither rubber gaskets nor putty shall be used in sealing connections.

### 3.9 FIXTURE SUPPORTS

- A. Urinal Support: Provide urinal chair carriers consisting of a pair of cast-iron feet bolted to or imbedded into the floor together with 1.66-inch outside diameter (minimum), steel tubular upright members, steel hanger support plate, and steel bearing plate connected to cast iron or steel adjustment sleeves and furnished with necessary bolts, nuts, washers, and chrome plated trim. Provide chair carrier that is fully concealed in the building construction and that supports the fixture in such a manner that no part of the fixture will be supported by the wall or the partition.
- B. Lavatory Support: Provide lavatory chair carriers consisting of a pair of cast-iron feet bolted to or imbedded into the floor together with 1.66- inch (minimum) steel tubular upright members, a horizontally adjustable alignment truss or tie rod at bottom and another at the top connected to cast-iron or steel adjustment sleeves and painted cast-iron or steel adjustment sleeves, and painted cast-iron concealed arms.

### 3.10 INSTALLATION OF PRESSURE REDUCING VALVES

- A. General: Install one or more pressure reducing valves on the main water line supplying plumbing fixtures.
  1. Provide each pressure reducing valve with a gate valve and union on both the inlet and outlet connections.
  2. A bypass one pipe size smaller than the main water line provided with a globe valve and union, shall be installed between the inlet and outlet sides of the pressure reducing valve assembly.
  3. Pressure gauges shall be installed at the inlet and outlet connections to the pressure reducing valve assembly. Gauges shall have T-handle stops in their connections.

### 3.11 STRAINER INSTALLATION

- A. General: Place strainers ahead of pressure reducing valves, automatic control valves, pumps, and elsewhere as indicated on the drawings or specified.

### 3.12 BACKFLOW PROTECTION VALVE INSTALLATION

- A. General: The entire water distribution system shall be protected against contamination due to backflow from non-potable sources. Each connection to a fixture or an item of equipment shall be protected in accordance with the requirements of the National Plumbing Code.
- B. Reduced Pressure Zone Backflow Preventer: Install a reduced pressure zone backflow preventer in the building water supply main to expansion tanks, condenser water systems, and boilers as shown on the drawings and/or as required by the local codes.

### 3.13 INSTALLATION OF PIPE SLEEVES

- A. Basic Requirements: Install pipe sleeves as follows:
  - 1. Pipe sleeves shall be provided for all pipes passing through walls, slabs on grade and floors. Sleeves may be omitted where pipes pass through exterior walls above ground to lawn faucets, wall hydrants and downspout nozzles.
  - 2. Sleeves for pipes passing through exterior walls and slabs on grade which do not have membrane waterproofing shall be of cast-iron or galvanized steel pipe or black steel pipe, Schedule 40.
  - 3. Sleeves for pipes passing through exterior walls, slabs on grade and floors which are provided with membrane waterproofing shall be of threaded galvanized steel pipe fitted with companion flanges and arranged to secure membrane. Companion flanges shall be drilled and tapped in such a manner that bolting is affected from the outer (or upper) face only.
  - 4. Sleeves for pipes passing through potentially wet floors that do not have membrane waterproofing such as in toilet rooms, cafeteria kitchens, serving areas, dishwashing rooms, utility cores, mechanical equipment rooms, and areas that are provided with fire protection sprinkler systems, shall be galvanized steel pipe, shall project 2 inches above the finished floors, and shall be caulked watertight.
  - 5. Sleeves for pipes passing through all other floors and walls shall be constructed of galvanized or black steel pipe, standard weight.
- B. Sleeves on New Work: On new work, sleeves shall be built into the walls and floors as the work progresses.

### 3.14 INSTALLATION OF CLEANOUTS AND FERRULES

- A. Riser Connection to Sewer or Drain: Where soil, waste, or roof drainage risers connect to a sewer or drain extending from the building above the lowest floor, the fitting at the base of each stack or downspout shall be a sanitary tee or a combination Y and 1/8 bend with cleanout plug in the end of the run of the main.
- B. Test Tees: Each vertical soil, waste, and vent pipe and each downspout and roof drainage pipe which connects to horizontal drain piping below ground shall be fitted with a test tee above the lowest floor or ground. Where accessible, test tee may be installed in the horizontal pipe at the base of the riser.
- C. Cover Plates: Where cleanouts or test tees occur on concealed pipes in finished rooms, they shall be provided with a 1/8-inch thick, machine finished, brass cover plate of sufficient diameter to cover the opening in the finished wall or partition. The cleanout plug shall have a solid head, tapped for a 1/4-inch brass screw to secure the cover plate. Where cleanout plugs extend beyond the wall finish, the cover plates shall be of machine finished brass and shall be only of sufficient depth to fit against the wall to cover plug. Cleanout cover plates shall be painted to match adjacent wall finish.



- D. Cleanouts Plugs for Threaded Fittings: Cleanout plugs for threaded fittings shall be in accordance with ANSI B16.12. Except for test openings, where size must be sufficient to admit test plug, bushings will be permitted on pipes 5-inches and larger to reduce plug size to 4 inches; cleanout plugs for piping 4 inches and smaller shall be the same size as the pipe.
- E. Cleanout Plugs for Hub-and-Spigot Fittings: Cleanout plugs for hub-and-spigot fittings shall be screwed into ferrules caulked into the fitting. Ferrules and plugs shall be in accordance with ANSI B16.12, except that plugs required to be flush with the floor shall have square countersunk heads in lieu of raised heads.
- F. Cleanout Plugs for Copper Drainage Lines: Cleanout plugs on copper drainage lines shall be installed in solder-joint fittings having threaded openings provided for the cleanout, or in solder-joint fittings with threaded adapters.

### 3.15 WATER PIPING INSTALLATION

- A. General: Water piping shall be complete from service connection to all fixtures and equipment outlets. Sizes of pipes shall be as shown or specified.
- B. Reaming: Ends of pipes and tubes shall be reamed before being made up.
- C. Threaded Joints: Threaded joints shall be made up metal-to-metal, with a noncorrosive lubricant applied to the male thread only. Lampwick or other packing material shall not be used in making up threaded joints.
- D. Chromium Plated Piping: Chromium plated piping shall be threaded and made up carefully, and not more than one full turn of thread shall be exposed beyond any fittings.
- E. Long Screws and Bushings: Long screws and bushings (other than bushings cast in the sand) shall not be used on water piping.
- F. Soldering: Ends of tubing and recesses of fittings to be soldered shall be thoroughly cleaned. Joints shall be assembled without binding. Solder shall penetrate fully and shall fill the joint completely. Joints shall be made using lead-free solder, as specified.
- G. Joint Materials: All joint materials shall be free from oil, tar, and greasy substances, and shall be dry when placed in the joint. The material shall be handled with care to prevent contamination.
- H. Copper Tubing: All copper tubing shall be free from cuts, dents or other surface damage at the time of final inspection. Damaged tubing shall be removed and replaced with new.
- I. Copper Tube Anchoring: Horizontal runs of copper tubing over 50 feet in length shall be anchored to wall or floor construction. Anchors shall be located near the midpoints of the runs so as to force the expansion equally to the ends or in a direction where expansion can take place without excessive strain.
- J. Swing Joints, Offsets, and Expansion Joints: Swing joints, offsets, and expansion joints shall be provided where necessary to accommodate expansion of piping, which will be approximately two inches in 100 feet of copper hot water piping.
- K. Dielectric Couplings: Where non-ferrous metal piping and zinc-coated metal piping are joined, dielectric (insulating) couplings, fittings or unions shall be provided.

- L. Reducing Fittings: Where pipe sizes shown or specified differ from the connection sizes of meters, pumps, fixtures, outlets, and the like, reducing fittings shall be installed close to them.
- M. Pipe Branches: Branches from water supply mains shall be taken from the top, bottom or side, using crossover fittings where required by structural or operating conditions.
- N. Up feed Hot Water Return: On up feed hot water distribution systems for which return circulation piping is shown, a 1/2" circulation connection shall be made at a point on each riser just below the highest outlet connection. Provide branch circulation lines with gate valves near the valves on corresponding supply lines.
- O. Down feed Hot Water Supply: Each down feed main for a hot water supply system shall be graded upward to the first branch connection, which shall be taken from the top of the main. Beyond the first connection the main shall grade downward, and all branch connections shall be taken from the bottom of the main. Connect a 1/2-inch circulating line to the bottom of each down feed riser. Provide branch circulating lines with gate valves in locations corresponding to the supply branch valve locations.
- P. Grading: Hot water supply and hot water circulating lines shall be accurately and uniformly graded to avoid traps which might impede or destroy circulation. All lines shall be graded so as to facilitate drainage.
- Q. Unions: Unions shall be installed near points of connection to each piece of equipment, and elsewhere as required for installation of piping, removal and replacement of regulating and control equipment and the like. Right and left couplings or nipples are prohibited.
- R. Water Hammer Arresters: Water hammer arresters shall be provided where indicated on the drawings. Water hammer arresters shall be approved and installed in accordance with the requirements of PDI-WH201 and shall bear the PDI seal of approval.
- S. Roughing: Roughing shall be provided for equipment furnished under other sections of the specifications.
- T. Where future extensions are indicated on the drawings, roughing shall extend to within the space to be served and shall be valved and capped or plugged.
- U. All indirect waste piping exposed in kitchen shall be Type "M" copper. PVC or ABS piping will not be acceptable.

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**DIVISION 22 - PLUMBING**

Section 22 0000

Plumbing

Section 22 0700

Insulation

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## SECTION 22 0700

### INSULATION

#### PART 1 – GENERAL

##### 1.1 WORK INCLUDED

- A. It is the intent of this section of the specifications that all hot (above 105 deg. F.) and cold (below 55 deg. F.) surfaces of all piping and mechanical system components be insulated, unless specifically excluded herein.
- B. Systems to be insulated:
  - 1. Supply air ductwork
  - 2. Culinary hot and cold-water piping systems
  - 3. Heating hot water piping systems
  - 4. Condenser water piping systems
  - 5. Roof drain piping systems
  - 6. Water, tempering valve and pipe, and waste lines below lavatories and handicapped sinks
  - 7. Cold box drains
  - 8. Domestic hot water storage tanks
  - 9. Cold box drain lines
  - 10. Make-up air unit ductwork
  - 11. Kitchen grease duct
  - 12. Refrigerant suction lines interior, refrigerant suction and liquid lines exposed to exterior.
- C. The providing of all materials, supplies, equipment, tools, transportation, and facilities and performing all labor and service necessary to provide the work outlined above and as shown on the working drawings.

#### PART 2 – PRODUCTS

##### 2.1 COMPLIANCE

- A. All insulation shall (as a minimum) conform to the requirements of the building code and have a flame spread rating of less than 25 and smoke developed less than 50.
- B. Insulation shall be manufactured by Johns-Manville, Owens-Corning, Knauf, Armstrong, or Certainteed.

##### 2.2 HEATING & CONDENSER WATER PIPING, DOMESTIC HOT & COLD-WATER PIPING

- A. All piping shall be insulated with 2-piece heavy density pipe insulation having an average thermal resistivity in the range of 4.0 to 4.6 Hr Deg. F. Ft<sup>2</sup>/BTU per inch of thickness on a flat surface at a mean temperature of 75 deg. F. Thickness of insulation shall be as follows:

Minimum Pipe Insulation in inches

| PIPING SYSTEM TYPES            | FLUID TEMP. RANGE, (deg. F) | CONDUCTIVITY (Btu-in./(h-ft <sup>2</sup> -deg F)) | <1" | 1" TO <1 1/2" | 1 1/2" TO <4" | 4" TO <8" | 8" TO >8" |
|--------------------------------|-----------------------------|---|-----|---------------|---------------|-----------|-----------|
| HEATING HOT WATER              | 141-200                     | 0.25-0.29   | 1.5 | 1.5           | 2.0           | 2.0       | 2.0       |
| CHILLED/ CONDENSER WATER       | 40-60                       | 0.21-0.27   | 0.5 | 0.5           | 1.0           | 1.0       | 1.0       |
| DOMESTIC HOT WATER (120 deg F) | 105-140                     | 0.21-0.28   | 1.0 | 1.0           | 1.5           | 1.5       | 1.5       |
| DOMESTIC HOT WATER (140 deg F) | 141-200                     | 0.25-0.29   | 1.5 | 1.5           | 2.0           | 2.0       | 2.0       |
| DOMESTIC COLD WATER            | 40-60                       | 0.21-0.27   | 0.5 | 0.5           | 1.0           | 1.0       | 1.0       |
| REFRIGERANT SUCTION LINE       | 40-60                       | 0.21-0.27   | 0.5 | 0.5           | 1.0           | 1.0       | 1.0       |
| COLD BOX DRAIN LINE            | 40-60                       | 0.21-0.27   | 0.5 | 0.5           | 1.0           | 1.0       | 1.0       |
| REFRIGERANT LIQUID LINE        | 105-140                     | 0.21-0.28   | 1.0 | 1.0           | 1.5           | 1.5       | 1.5       |
| ROOF DRAIN                     | <40                         | 0.20-0.26   | 0.5 | 1.0           | 1.0           | 1.0       | 1.5       |

- a. Piping in conditioned partitions may have insulation reduced by 1" to a minimum insulation of 1" if piping diameter is less than 1 1/2" See IECC 2018 403.11. Reduced insulation length must be less than 12 ft.
- b. For piping exposed to outdoor air, increase thickness by 1/2"
- c. Direct buried Hot water may have insulation reduced by 1 1/2" to a minimum insulation of 1", see IECC 2018 403.11.

B. Heating and chilled/condenser water piping inside fan room and in boiler room shall be covered with a heavy-duty white PVC cover & fittings. Cover shall be white with colored markings per type of pipe content with I.D. and flow on cover.

C. Exposed CWS, CWR and make-up water piping at cooling tower and where exposed in enclosure shall be covered with an aluminum all weather jacket.

D. Exposed refrigerant suction and liquid lines on roof shall be insulated and then covered with an aluminum all weather jacket.

1. Required for condensing unit CU-1 refrigerant & suction lines.
2. Required for all AC split system refrigerant & suction lines.

E. Pipe insulation shall be covered with an all-service jacket.

### 2.3 ROOF DRAIN PIPING

A. Roof drain piping (both primary and secondary) except in masonry wall and where buried in the ground, shall be insulated as specified for domestic cold water. Insulation thickness shall be 1".

- B. Roof drain piping and fittings running exposed in occupied public areas shall be covered with a white PVC cover.

#### 2.4 CHILLED/CONDENSER WATER AIR ELIMINATION TANKS

- A. Insulate with removable and replaceable covers consisting of No. 20 gauge galvanized sheet metal jacket lined with 2" thick high-density polystyrene insulation. The insulation shall have an average "K" factor or .22. All voids between insulation and pump housing shall be filled insulation. Closure joints of metal casing shall be vapor-sealed after the covers are in place.

#### 2.5 DOMESTIC HOT AND COLD-WATER PIPING BELOW SLAB

- A. Piping shall be insulated with 1/2" thick armafex close cell flexible foam insulation.

#### 2.6 REFRIGERANT SUCTION PIPING

- A. Refrigerant suction piping shall be insulated with 1/2" thick closed cell flexible foam. Insulation exposed to outside shall be finished with two heavy coats of U.V. resistant grey sealer.

#### 2.7 WATER & WASTE PIPING EXPOSED BELOW LAVATORIES AND ADA SINKS

- A. Insulate all exposed surfaces with an approved ADA insulation kit as required by sink manufacturer.

#### 2.8 DOMESTIC HOT WATER STORAGE TANKS

- A. All hot surfaces shall be insulated with 2" thick high-density polystyrene insulation with coated joints and an all service jacket. Insulation shall have an average 'K' factor of .22 All voids between tank and jacket shall be filled with insulation.

#### 2.9 HOT WATER HEATING AIR ELIMINATION TANKS

- A. All hot surfaces shall be insulated with 2" thick high-density polystyrene insulation with coated joints and an all service jacket. Insulation shall have an average 'K' factor of .22 All voids between tank and jacket shall be filled with insulation.

#### 2.10 MEDIUM PRESSURE DUCTS

- A. Medium pressure ducts shall be externally insulated with 1 1/2" thick 1.0 lb. density mineral fiberglass insulation. Insulation shall be furnished with an integral FSK vapor barrier jacket. Insulation shall be applied with edges tightly butted and secured by impaling on pins welded to the duct or on metal clips, previously adhered to the ducts with manufacturer's adhesive. Pins or clips shall be spaced to hold insulated firmly against the duct surface. Where required, insulation on the underside of all horizontal ducts and sloping ducts shall be additionally secured by applying an adhesive. All penetrations shall be sealed with vapor barrier adhesive. All seams shall be covered with 2" wide strips of same insulation facing material adhered with adhesive.

#### 2.11 MEDIUM PRESSURE FLEXIBLE DUCT

- A. Flexible supply air ducts shall be insulated with 1" thick 1.5# density duct wrap with vapor barrier. Insulation shall comply with UMC Standard 10-1.



## 2.12 LOW PRESSURE ROUND DUCTS

- A. All round metal ducts shall be wrapped with 1" thick fiberglass duct wrap with factory-applied vapor barrier. All joints shall be sealed with mastic and taped to form a neat and complete insulation system.

## 2.13 MAKEUP AIR UNIT SUPPLY DUCT

- A. Wrap makeup air unit exhaust duct with 1" thick fiberglass blanket with FSK barrier.

## 2.14 DUCTS ABOVE ROOF

- A. Ducts above roof shall be covered with 2" thick 3 lb. density rigid duct board secured with duct clips and covered with .016" aluminum sheet as hereinafter specified. Do not line make-up air ductwork.
- B. Material shall comply with IMC Standard 10-1.

## 2.15 GREASE HOOD DUCTS

- A. Ducts to be wrapped with a refractory ceramic fiber blanket with reinforced aluminum foil cover. Blanket to be installed in accordance with manufacturer's recommendations. Product to be "Firemaster" blanket duct wrap as manufactured by Thermal Ceramics or approved equal.

## 2.16 COLD BOX DRAIN LINES

- A. Cold box drain lines shall be insulated the same as refrigeration suction piping.

## PART 3 – EXECUTION

### 3.1 GENERAL

- A. The contractor shall provide a complete installation which is neat in appearance and functional.
- B. Remove all excess materials and packaging from the job site.
- C. All insulation shall be continuous through the wall and ceiling openings and thru sleeves.
- D. Insulation on all cold surfaces where vapor barrier jackets are used will be applied with a continuous, unbroken vapor seal. Hangers, supports, anchors, etc., that are secured directly to cold surfaces must be adequately insulated and vapor-sealed to prevent condensation.
- E. Valves and fittings inside the building shall be insulated as specified for the piping systems and covered with high temperature P.V.C. insulation fitting covers.
- F. Fittings and valves for pipe size smaller than 4" shall be insulated and finished with Insulating and Finishing Cement to a thickness equal to the adjoining pipe insulation. Fittings and valves for pipe sizes 4" and larger shall be insulated with segments of the molded insulation secured with No. 20 gage galvanized annealed steel wire finished with a smoothing coat of finishing cement. Vapor seal with a layer of glass fabric embedded between two 1/16" coats of vapor seal adhesive. Lap seal outer jacket at least 1" on itself adjoining insulation.

- G. All terminations of insulation ends shall be tapered and covered with finishing cement.
- H. In exposed areas, all fittings shall be additionally finished with FSK wrap smoothly adhered. Overlap the FSK wrap on itself and adjoining pipe insulation. Overlap to be at least 1" on pipe insulation below 4" and 2" on sizes 4" and above.
- I. Insulation inserts and shields for cold surface piping such as roof drain lines and domestic cold-water piping shall be installed at all pipe hangers. Inserts between the pipe and pipe hangers shall consist of calcium silicate block insulation of equal thickness to the adjoining insulation and shall be provided with vapor barrier where required. Insulation inserts shall not be less than the following lengths:
 

|                          |          |
|--------------------------|----------|
| 1/2" to 2-1/2" pipe size | 6" long  |
| 3" to 6" pipe size       | 9" long  |
| 8" to 10" pipe size      | 12" long |
- J. Rigid metal shields shall be applied between hangers or supports and the pipe insulation. Shields shall be formed to fit the insulation and shall extend up to the centerline of the pipe and length specified for the insulation hanger inserts.
- K. Vapor barrier wrap shall be sealed tight and not penetrated by the hanger or shield.
- L. Adhesives, mastics, and coatings shall be applied at the manufacturer's recommended minimum coverage per gallon.
- M. Where insulation pipes pass thru sound or fire-rated walls, floors, or ceilings, the insulation sleeves shall be sound or fire-rated to match rating of surface penetrated.
- N. All insulation which runs outside of the building, or inside of the building in areas where the insulation will be exposed to physical abuse, shall be jacketed with a minimum thickness of .016-inch aluminum. The insulation and aluminum shall be secured in place by a continuous friction type joint to provide a positive weatherproof seal along the entire length of the aluminum jacket. Then, an aluminum preformed strap containing a permanently plastic weatherproof sealant shall be centered over each circumferential joint, and secured by tightening on a clip, or by use of separate 1/2-inch-wide stainless-steel banding. All elbows, tube, turns, sweeps, and bends shall be insulated with mitered sections of aluminum-jacketed insulation. Joints shall be sealed with a sealing compound and preformed aluminum bands. Valves shall be covered by prefabricated sections of aluminum-jacketed insulation according to manufacturer's recommendation.
- O. Insulation of storage tanks, manholes, hand holes, and at flanged ends of heat exchangers shall be applied so that these items can be removed without damaging the insulation.

### 3.2 INSULATION WORKMANSHIP

- A. All insulation shall be applied by specialists experienced in the field, and shall be neat in appearance. Neatness in appearance shall be equated to proper insulation application procedures, and sloppy workmanship will not be tolerated. Work which is deemed unacceptable shall be condemned, removed, and replaced at the contractor's expense.
- B. Protect floors, valve handle, accessories, etc., to keep paste off areas not being insulated.
- C. Splitting of longitudinal sections on flexible foam pipe insulation will not be permitted.

- D. Do not install insulation on pipes which require heat taping without coordinating with mechanical contractor.

3.3 CLEAN-UP

- A. The piping shall be cleaned and tested prior to installation of insulation.
- B. Fittings shall be cleaned after insulation is installed.

End of Section

## SECTION 23 0000

### HEATING COOLING

#### PART 1 – GENERAL

##### 1.1 SCOPE

- A. The installation covers the furnishing and installing coils, pumps, piping systems, and all necessary trim and specialties, etc., as specified and shown on drawings or as required to provide the complete heating and air conditioning systems shown on the drawings and specified herein.

##### 1.2 **See specifications section 230100-10.3.3.E & 230100-10.3.3.F for factory training requirements.**

##### 1.3 PIPE

- A. A complete and ample system of heating water/glycol & condenser/chilled water piping shall be installed as shown on the plans.
- B. Piping shall be properly graded and supported to prevent water and air pockets from forming, and to insure noiseless circulation throughout the system.
- C. Branches leading from the mains shall be taken off from the top or sides of the mains at 90 deg., except where otherwise directed. These branches shall be arranged with swing connections to accommodate expansion and contraction.
- D. All mains reducing in size shall be reduced with eccentric reducing fittings, with top of pipe level for water.
- E. Run all piping as high as possible.
- F. All heating water and condenser/chilled water piping above 2" shall be welded.

#### PART 2 – PRODUCTS

##### 2.1 HOT WATER BOILER: (High –Efficiency boiler)

- A. The hot water boiler shall be designed for 160 psig hot water working pressure. The maximum water temperature will be 250 deg. F.
- B. The boiler shall have the capacity and characteristics listed on the plans when fired with natural gas, 890 BTU/cu.ft.
  - 1. High Efficiency - Condensing Type
  - 2. Full Modulating Low NOx Fiber Mesh burner
  - 3. 5:1 Turndown ratio (minimum)
  - 4. O2 Trim
  - 5. 439 Stainless Steel Fire Tube Heat Exchanger
  - 6. Designed for Primary/Secondary Flow Installation
  - 7. 9 PPM NOx or less

8. BACNET Compatible for integration into the buildings temperature controls systems.
  9. Flue Vent: Ducted AL29-4C
  10. Combustion Air Vent: AL29-4C
  11. Indoor/Outdoor Reset
  12. Boiler Sequencing for operating boilers at peak efficiency.
  13. 10 Year full (non-prorated) warranty on the heat exchanger.
- C. Electrical power available will be 120V/1PH/60 HZ.
- D. Boiler to be furnished complete with motorized isolation valve for bubble tight shut off. Belimo Actuators, BACNET integration into the building ATC. Provide factory condensate Neutralization kit and gas pressure regulator.
- E. Submittals
1. Product data sheet (including dimensions, rated capacities, shipping weights, accessories)
  2. Wiring diagram
  3. Warranty information
  4. Installation and operating instructions
- F. Quality Assurance
1. Regulatory Requirements
    - a. ANSI Z21.13/CSA 4.9
    - b. Local and national air quality regulations for low NOx (0-30 PPM NOx emissions) boilers
  2. Certifications
    - a. UL, CUL
    - b. ASME H Stamp and National board Listed
    - c. ISO 9001
- G. General
1. The boilers shall be fired with 4-14-inch WC gas at a rated input of 890 BTU/hr.
  2. The boilers shall be CSA tested and certified with a minimum AHRI efficiency of 95 percent at full fire.
  3. The boilers shall be ASME inspected and stamped and National Board registered for 160 PSIG working pressure and 250 deg. F. maximum allowable temperature, complete with a Manufacturer's Data Report.
- H. Boiler Control
1. The following safety controls shall be provided:
    - a. High limit control with manual reset
    - b. Flow switch, mounted and wired
    - c. ASME pressure relief valve PSIG as required for installation, piped by the installer to an approved drain
    - d. Temperature and pressure gauge (shipped loose)

- e. The boilers shall be equipped with a PID modulating temperature controller with LCD display that incorporates an adjustable energy-saving pump control relay and is factory mounted and wired to improve system efficiency; three water sensors included (system sensor is loose).

I. Firing Mode

- 1. Provide electronic modulating control of the gas input to the boiler.

J. Boiler Diagnostics

- 1. Provide external LED panel displaying the following boiler status/faults:
  - a. Power on
  - b. Call for heat
  - c. Burner firing
  - d. Service
- 2. Provide internal circuit board indicating the following safety faults by LED signal:
  - a. System enabled
  - b. Manual reset high limit
  - c. Auto reset high limit (optional)
  - d. Low water cut-off (optional)
  - e. Blocked vent
  - f. Low gas pressure switch (optional)
  - g. High gas pressure switch (optional)
  - h. Air pressure
  - i. Flow switch
  - j. Ignition lock-out
- 3. Provide ignition module

K. Combustion Chamber

- 1. The combustion chamber wrapper shall be sealed and encased in insulation to reduce standby radiation losses, reducing jacket losses and increasing unit efficiency.

L. Cabinet

- 1. The corrosion resistant galvanized steel jackets shall be finished with a baked-on epoxy powder coat, which is suitable for outdoor installation, applied prior to assembly for complete coverage, and shall incorporate louvers in the outer panels to divert air past heated surfaces.
- 2. The boilers, if located on a combustible floor, shall not require a separate combustible floor base.
- 3. The boilers shall connect both the combustion air and flue products through the back of the unit.

M. Boiler Operating Controls:

1. The boiler(s) shall feature a modulating digital controller with selectable outdoor reset mode option, mounted and wired.
2. System sensor and optional air temperature sensor shall be shipped loose for field installation by installing contractor. Inlet/Outlet sensors are factory-installed.
3. Provide all components required for tie-in to specified BMS system.

N. Direct Vent:

1. The boilers shall meet safety standards for direct vent equipment as noted by the 2012 International Mechanical Code, sections 802.2.5 and 1107.6, and ASHRAE 15-1994, section 8.13.6.
2. Boilers to be complete with factory intake and vent termination kits sized for project application.

O. Source Quality Control:

1. The boilers shall be completely assembled, wired, and fire-tested prior to shipment from the factory.
2. The boilers shall be furnished with the ASME Manufacturer's Data Report, inspection sheet, wiring diagram, rating plate, combustion analysis, and Installation and Operating Manual.

P. Installation:

1. Must comply with:
  - a. Local, state, provincial, and national codes, laws, regulations and ordinances
  - b. International Fuel Gas Code, NFPA 54/ANSI Z223.1 – latest edition
  - c. National Electrical Code, ANSI/NFPA 70 – latest edition
  - d. Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD1
  - e. Manufacturer's installation instructions, including required service clearances and venting guidelines
2. Manufacturer's representative to verify proper and complete installation.

Q. Start-Up:

1. Shall be performed by factory-trained and factory-authorized personnel.
2. Test during operation and adjust if necessary:
  - a. Safeties (2.2 - F)
  - b. Operating Controls (2.3)
  - c. Static and full load gas supply pressure
  - d. Gas manifold and blower air pressure
  - e. Amp draw of blower
3. Submit copy of start-up report to Architect and Engineer.

R. Training:

1. Provide factory-authorized service representative to train maintenance personnel on procedures and schedules related to start-up, shut-down, troubleshooting, servicing, and preventive maintenance.
2. Schedule training at least seven days in advance.

S. Warranty:

1. Limited one-year warranty from date of startup.
2. 10 years thermal shock warranty.
3. Full ten-year closed-system heat exchanger warranty.

T. Manufacturers: Aerco, Laars, Lochinvar or approved equal.

2.2 COOLING TOWER (Induced Draft, Counterflow)

A. Manufacturer: Marley, Baltimore Aircoil, Evapco or approved equal.

B. Base:

1. Provide an induced draft, crossflow type, factory assembled, film fill, industrial duty, galvanized steel cooling tower situated as shown on the plans. The limiting overall dimensions of the tower shall be as scheduled in documents. Total operating power of all fans shall not exceed schedule H.P. Tower shall be similar and equal in all respects to model specified.
2. The cooling tower shall be designed for quiet operation and shall produce an overall level of sound not higher than 74 dB(A) 2 measured at 5.0 ft from top of tower. Sound power level db(a) 94. Sound levels shall be independently verified by a CTI-licensed sound test agency to ensure validity and reliability of the manufacturer's published values. Measurement and analysis of the sound levels shall be conducted by a certified Professional Engineer in Acoustical Engineering. Sound pressure levels shall be measured and recorded in the acoustic near-field and far-field locations using ANSI S1.4 Type 1 precision instrumentation and in full conformance with CTI ATC-128 test code published by the Cooling Technology Institute (CTI). All low sound options shall be CTI certified for thermal performance.

C. Thermal Performance:

1. The tower shall be capable of cooling scheduled gpm of water from 85 °F to 75 °F at a design entering air wet-bulb temperature of 68 °F, and its thermal rating shall be Certified by the Cooling Technology Institute.
2. The tower shall be capable of a minimum 65.124 gpm/Hp efficiency per ASHRAE Standard 90.1.



D. Performance Warranty:

1. CTI Certification notwithstanding, the cooling tower manufacturer shall guarantee that the tower supplied will meet the specified performance conditions when the tower is installed according to plan. If, because of a suspected thermal performance deficiency, the owner chooses to conduct an on-site thermal performance test under the supervision of a qualified, disinterested third party in accordance with CTI or ASME standards during the first year of operation; and if the tower fails to perform within the limits of test tolerance; then the cooling tower manufacturer will pay for the cost of the test and will make such corrections as are appropriate and agreeable to the owner to compensate for the performance deficiency.

E. Design Loading:

1. The tower structure, anchorage and all its components shall be designed by licensed professional engineers, employed by the manufacturer, per the International Building Code to withstand a wind load of 30 psf, as well as a .3g seismic load. The fan deck, hot-water basin covers and, where specified, maintenance platforms shall be designed for 60 psf live load or a 200 lb concentrated load. Guardrails, where specified, shall be capable of withstanding a 200 lb concentrated live load in any direction, and shall be designed in accordance with OSHA guidelines.
2. The tower shall be structurally capable of being supported at the four outer corners of the tower cell. Alternatively, the tower manufacturer shall provide supporting steel to adapt tower to be supported at four outer corners.

F. Construction:

1. All components of the cooling tower shall be fabricated of 316 stainless steel, protected against corrosion by G-235 galvanizing. The tower shall be capable of withstanding water having a pH of 6.5 to 8.0; a chloride content (NaCl) up to 300 ppm; a sulfate content (SO<sub>4</sub>) up to 250 ppm; a calcium content (CaCO<sub>3</sub>) up to 500 ppm; and silica (SiO<sub>2</sub>) up to 150 ppm. The circulating water shall contain no oil, grease, fatty acids or organic solvents.
  - a. Fiberglass casing, polyurethane barriers, and thermosetting hybrids and the components they are adhered to shall be considered non-recyclable and not allowed.
2. The specifications, as written, are intended to indicate those materials that will be capable of withstanding the above water quality in continuing service, as well as the loads described in paragraph 4.1. They are to be regarded as minimum requirements. Where component materials peculiar to individual tower designs are not specified, the manufacturers shall take the above water quality and load carrying capabilities into account in the selection of their materials of manufacture.

G. Mechanical Equipment:

1. Fan(s) shall be propeller-type, incorporating aluminum alloy blades attached to galvanized hubs with U-bolts. Blades shall be individually adjustable. Maximum fan tip speed shall be 13,000 ft/min. Fan(s) shall be driven through a right angle, industrial duty, oil lubricated, geared speed reducer that requires no oil changes for the first five (5) years of operation. All gearbox bearings shall be rated at an L10A service life of 100,000 hours or greater and the gear sets shall have AGMA Quality Class of 9 or greater. The gearbox shall include any modifications to enable operation down to 10% of full speed.
2. Single-speed motor(s) shall be NEMA Premium Efficiency, TEFC, 1.15 service factor, inverter duty, variable torque, and specially insulated for cooling tower duty (Class F). Speed and electrical characteristics shall be 1800 rpm, single-winding, 3-phase, 60 Hz, 460 volts. Motor shall operate in the shaft-horizontal position for gear drive towers and shaft-down position for belt drive towers. Nameplate horsepower shall not be exceeded at design operation.
3. The motor to gearbox close coupling shall be a tire-type, single piece, flexible element design to accommodate frequent speed changes that are inherent with VFD applications.
4. The complete mechanical equipment assembly for each cell shall be supported by two horizontal steel beams that resist misalignment between the motor and the gear reducer/belt drive system. The mechanical equipment assembly shall be warranted against any failure caused by defects in materials and workmanship for no less than five (5) years following the date of tower shipment. This warranty shall cover the fan, speed reducer, drive shaft and couplings, and the mechanical equipment support. The electric motor shall carry a manufacturer's warranty of at least one year.

H. Fill, Louvers and Drift Eliminators:

1. Fill shall be film type, thermoformed of PVC, with louvers and eliminators formed as part of each fill sheet. Fill shall be suspended from hot dip galvanized structural tubing supported from the tower structure and shall be elevated above the floor of the cold-water basin to facilitate cleaning. Air inlet faces of the tower shall be free of water splash out.
2. Drift eliminators shall be PVC, triple-pass, and shall limit drift losses to 0.005% or less of the design water flow rate.

I. Water Distribution System:

1. Two open galvanized steel basins (one above each bank of fill) shall receive water piped to each cell of the tower. These basin components shall be installed and sealed at the factory and assembled with bolted connections. Tap screws shall not be allowed due to their potential to develop leaks. The basins shall be equipped with removable, galvanized steel covers capable of withstanding the loads described in paragraph 4.1. The water distribution system shall be accessible and maintainable during tower fan and water operation.
2. Each basin shall include an inlet hole and bolt circle to accept a 125# flange connection per ANSI B16.1. Removable, interchangeable polypropylene nozzles installed in the floor of these basins shall provide full coverage of the fill by gravity flow.
3. The water distribution system shall be accessible and maintainable while tower is operating.

J. Casing, Fan Deck and Fan Guard:

1. The casing and fan deck shall be galvanized steel and shall be capable of withstanding the loads described in paragraph 4.1. The top of the fan opening shall be equipped with a conical, non-sagging, removable fan guard, fabricated of welded 5/16" and 7-gauge rods, and hot dip galvanized after fabrication. Fan cylinders 5'-0" in height and over shall not be required to have a fan guard.

K. Access:

1. A large galvanized, rectangular access door shall be located on both cased faces for entry into the cold-water basin. Doors shall provide convenient access to the fan plenum area to facilitate inspection and allow maintenance to the fan drive system. The access doors shall be at least 30" wide by 33" high.
2. A large stainless steel, rectangular access door shall be located on both cased faces for entry into the cold-water basin. Doors shall provide convenient access to the fan plenum area to facilitate inspection and allow maintenance to the fan drive system. The access doors shall be at least 30" wide by 33" high.

L. Cold Water Collection Basin:

1. The collection basin shall be 316 stainless steel and assembled with stainless bolted connections. Tap screws shall not be allowed due to their potential to develop leaks. The basins shall include the number and type of suction connections required to accommodate the outflow piping system shown on the plans. Suction connections shall be equipped with debris screens. A factory installed, (5) probe, 120 v 24 amp mechanical make-up valve shall be included. An overflow and drain connection shall be provided in each cell of the cooling tower. The basin floor shall slope toward the drain to allow complete flush out of debris and silt that may accumulate. Towers of more than one cell shall include a method for flow and equalization between cells. The basin shall be accessible and maintainable while water is circulating.
2. Probe to be field installed and wired by the installing contractor.

M. Required Options:

1. 316 stainless steel construction and basin.
2. Perimeter base rail support.
3. Air- Inlet screens.
4. Extended lube lines.
5. Motor to be outside of airstream.
6. Sweeper piping.
7. OSHA approved ladder and guardrail.
8. Ladder extension as required.

9. Ladder safety cage,
10. Access door platform.
11. Plenum service walkway.

## 2.3 HOT WATER AND COOLING WATER SPECIALTIES

- A. Furnish and install complete the water specialties including all air vents, and specialty items required to provide a complete and operable hot and chilled water system.
- B. Manual air vents shall be installed at all high points in the water system. Air vents shall be 3/8" ball valves and shall be installed on a 1/2" pipe nipple--6" long. Run 1/4" copper tube from vent to near floor--anchor tube securely to wall, pipe, or structural member.

## 2.4 WATER TREATMENT FOR HEATING WATER & CONDENSER/COOLING WATER SYSTEMS

- A. Contractor shall furnish and install chemical treatment of the condenser/cooling and boiler heating water system on initial start-up to prevent the formation of scale, corrosion, sludging, and carry-over. The chemical supplier shall analyze the raw water and prescribe the proper treatment formulation for the boiler system.

## 2.5 CHEMICAL TREATMENT FOR COOLING TOWER WATER SYSTEMS

- A. The chemical treatment system and chemicals used must comply with state and local air and water pollution requirements. Each water treatment control program shall consist of the following equipment, chemicals, and services:
  1. Cooling tower treatment chemicals for prevention of scale, corrosion, and microbiological fouling shall be included in all proposed treatment programs.
  2. The chemical feed controller shall be installed, programmed, and configured to provide:
    - a. Automatic bleed-off of water to maintain dissolved solids at a level sufficient to protect against mineral scale.
    - b. Automatic feed of corrosion and scale inhibitor necessary to protect the condenser water from corrosion and scale. A bleed/then feed controller logic may be sufficient. Additional controls and instrumentation may be included in the bid so long as future service, ease of maintenance, and chemical costs are considered when bidding.
    - c. Automatic feed of biocide(s) necessary to protect the condenser water system from microbiological fouling. This may include non-oxidizing and/or oxidizing biocides.
  3. Testing equipment should be provided so that the proposed treatment control program can be verified by District personnel.
    - a. A minimum of a TDS meter shall be provided with an open recirculating condenser water system.
    - b. Contractor shall provide a Water Analysis test kit for pH, Alkalinity, Hardness, Conductivity and treatment analysis.

- c. The contractor shall provide an adequate supply of reagents to test for chemical dosages and bleed off requirements. A handheld fluorometer will be supplied to calibrate the controller.
4. Prior to the condenser water system being used to provide cooling to the school, a fully operational treatment controller, as described above, shall be installed and operational. Installed and operational shall mean that, at a minimum, the following requirements are satisfied:
  - a. The controller and sensors shall be installed and measuring water conditions.
  - b. The controller and sensors shall be calibrated and provided with accurate control of the water conditions.
  - c. The chemical pumps shall be installed and feeding chemical to protect the condenser water system from corrosion, scale, general fouling, and microbiological fouling.
  - d. The water treatment contractor will provide as part of their contract access to an online reporting service. The reporting service will provide for the input of all on-site wet analysis, adjustments and observations. The reporting service will connect to the data-log capability of the controller and will receive daily downloads of the data recorded by the controller through the cellular modem. The owner will have access to the reporting and trending functions of the reporting service. Start-up and owners training will include no less than (4) hours of training on the functions of the reporting system.
  - e. It is imperative to assess the metallurgy of the cooling system and design a startup program that will protect the coatings of the metal surfaces. Some coatings such as galvanizing require special passivation procedures to ensure the integrity of the coating. Each equipment manufacturer outlines the passivation procedure for their individual equipment. This passivation procedure is to be followed exactly as outlined by the manufacturer. All passivation procedures must be documented and submitted to the owner.
  - f. In the event the manufacturer does not publish specific cooling tower passivation procedures the water treatment provider should adhere to the procedures published by either ASHRAE or CTI. The passivation procedure is to be approved by the engineer prior to equipment startup.
5. Training on the operation of the controller, test equipment, and appropriate system setpoints must be provided to District personnel. Minimum training (2) hours.
6. A minimum of (3) monthly services shall be provided during the 12-month warranty period. Reports shall be sent via email to the contractor and the School District representatives. A report must include the measurement of:
  - a. Tower Water Calcium Hardness reported as PPM as  $\text{CaCO}_3$
  - b. Tower Water & Make-Up Water Conductance reported as  $\mu\text{S}/\text{cm}$
  - c. Tower Water Total (M) Alkalinity reported as PPM as  $\text{CaCO}_3$
  - d. Tower Water Free Chlorine Levels (when oxidizing biocides are fed) reported as PPM as  $\text{Cl}_2$

e. Tower Water Inhibitor Levels reported as PPM as OP

f. Tower Water LSI Levels

B. Chemical Feeding Equipment for Cooling Tower Systems:

1. One (1) inhibitor chemical feed pump and tank assembly.
2. One (1) biocide chemical feed pump and tank assembly
3. One (1) oxidizing biocide chemical feed capable of reliably pumping an oxidizing chemical. This means that the pump must be equipped with a degasifying head or a peristaltic pumping action.
4. Each chemical feed pump is to be provided with an appropriate feed rate, pressure, and material compatibility for the chemical being fed and its target concentration in the condenser water system.
5. Provide one (1) sulfuric acid pump shall be provided. The chemical feed pump is to be provided with an appropriate feed rate, pressure, and material compatibility for the chemical being fed and its target concentration in the condenser water system. Additionally, if sulfuric acid is to be used, a corporation stop must be used to inject the acidic water into the centerline of the condenser pipe to protect the pipe from corrosion.
6. One (1) water meter with an electrical contacting register must be installed in the make-up water line going to the cooling tower system. The water meter to be of appropriate size for handling the make-up water requirements to the cooling tower and to be preset to give an electrical impulse each time a present number of gallons of make-up water enters the cooling tower basin.
7. One (1) electrically operated (1/60/115 volt) valve of appropriate size, as indicated on the drawings, is to be supplied for use in conjunction with the chemical feed control system.

C. System shall be furnished by Power Engineering, SLC or Water and Energy Systems Technology, W.E.S.T., Inc. SLC.

2.6 TESTING EQUIPMENT

- A. Supply a test set consisting of three automatic burettes enclosed in a wall-mounted cabinet with an internal light. Included are all components necessary to test for pH, "P" and "M" alkalinity, chloride, hardness, and total phosphate. The test set is to include an initial supply of all reagents.
- B. Furnish a supply of log sheets on which to record the test results and a digital copy of full testing instructions.

2.7 BASE-MOUNTED PUMPS

- A. Furnish and install the base-mounted pumps of the size, type, and capacity indicated on the drawings. Pumps shall meet or exceed the minimum efficiencies listed on schedule.
- B. All base-mounted pumps shall be single stage, non-overloading, centrifugal volute type. Impellers shall be bronze and shall be dynamically balanced. Bearings shall be of the ball or roller type and the shaft be stainless steel.

- C. Pumps shall be provided with leakless mechanical shaft seal. All pumps shall be provided with flexible couplings which shall impose no restriction or normal end play or expansion. Each pump shall be provided with a cast iron or steel baseplate of ample size to hold both the pump and motor in alignment. Pumps and motor shall be aligned when running at normal temperature. Final alignment shall be made immediately prior to testing under the supervision of a representative of the pump manufacturer. All pumps shall operate at 1750 RPM. Motors shall be phase and voltage specified on plans, horizontal ball bearing, drip-proof. Pumps shall be designed in accordance with the standards of the Hydraulic Institute, including the latest modifications.
- D. Non-Overloading: Motor brake horsepower shall not be exceeded at any point of the pump characteristic curve.
- E. Rising Curve: Pump characteristic curve shall rise continuously from maximum capacity to shut-off, with shut-off head minimum 10 percent greater than the design head, except for double suction pumps to shut-off head shall be 20 percent greater than design head.
- F. Working Pressure: Construct pumps for the working pressure in pounds per square inch specified or indicated. Factory test at 1.5 times working pressure.
- G. High points of pump casing shall be provided with air vent cocks. Cocks shall be extended outside of insulation specified.
- H. Premium efficiency motors shall be based on CEE premium efficiency criteria for OPD motors at 1800 RPM.

| HORSEPOWER | NEMA PREMIUM EFFICIENCY |
|------------|-------------------------|
| 5          | 89.5%                   |
| 7.5        | 91.0%                   |
| 10         | 91.7%                   |
| 15         | 93.0%                   |
| 20         | 93.0%                   |
| 25         | 93.6%                   |
| 30         | 94.1%                   |
| 40         | 94.1%                   |
| 50         | 94.5%                   |

- I. Pumps shall be Bell & Gossett, Armstrong or Taco.

**2.8 PUMP SUCTION DIFFUSERS**

- A. Pump suction diffusers to match the system pipe size and pump inlet size shall be furnished and installed where shown on the drawings. Units shall consist of angle type body with inlet vanes and combination diffuser-strainer-orifice cylinder.
- B. Suction diffuser shall be Bell & Gossett, Armstrong or Taco.

**2.9 AIR SEPARATORS**

- A. Type: Provide air separators of tangential type constructed of steel and tested and stamped in accordance with section 8 of the ASME Code for a working pressure of 125 psig.

- B. Provide separators on hydronic systems capable of separating not less than 80 percent of the entrained air on the first passage of water and not less than 30 percent of residual air on each subsequent passage through the separator.
- C. Provide flanged inlet and outlet connections, 3/4-inch diameter valve drain connection and 1-inch diameter top air eliminator connection.
- D. Provide 1-inch diameter pipe from the top air eliminator point to a 5-gallon, steel, ASME stamped 125-pound working pressure air receiver vessel with automatic float vent.
- E. Provide 1-inch diameter globe valve between the air separator and the air receiver.
- F. Air separator shall be Bell & Gossett, Armstrong or Taco.

#### 2.10 EXPANSION TANKS

- A. Furnish and install pre-pressurized diaphragm-type expansion tanks of sizes indicated on the drawings.
- B. Construct tanks of steel in accordance with section 8 of the ASME Code for a working pressure of 125 psig. Test and stamp tanks for the working pressure.
- C. Support tanks on 2-inch diameter steel pipe legs with cross bracing and floor plates or suspend on steel saddles with all-thread rod anchored to the structure.
- D. The tanks shall be the product of a manufacturer who certifies that his tanks have been a standard production model for five years prior to opening bids and warrants the diaphragm material unconditionally, against failure or leakage for a period of five years from the date of project acceptance.
- E. Expansion tank shall be Bell & Gossett, Armstrong or Taco.

#### 2.11 IN-LINE PUMPS

- A. In-line pumps shall be of the electric motor driven type, of the capacities specified on the drawings.
- B. Pumps shall be single stage, single suction, centrifugal type with hydraulically balanced impeller. All pumps shall be bronze fitted throughout with a cast iron casing and stainless-steel shaft. Pumps shall be provided with mechanical seals and pump and motor shall be direct connected or provided with a spring dampened coupling.
- C. Pumps shall be Bell & Gossett, Armstrong or Taco.

#### 2.14 CUSTOM BUILT AIR HANDLING UNITS

- A. Furnish complete the custom rooftop units shown on the schedule. Units shall have hot water heating coils, chilled water-cooling coils or DX cooling coils and evaporative cooling section.
  - 1. Evaporative section only for AHU-1, AHU-2 & AHU-3.
  - 2. AHU-4 is a hot water, DX cooling unit.
- B. Units shall be UNITECH, York, Hakkon, or Energy Labs, or approved equal.



- C. Units shall be furnished complete with factory start-up and one-year parts and labor warranty follow-up services.
- D. Units shall have the heating, cooling, and air delivery capacity, and nominal physical characteristics shown on the schedule.
- E. Unit manufacture shall coordinate production & delivery schedule with contractor prior to start of construction.
- F. HVAC Contractor is responsible to coordinate required production & delivery with General Contractor immediately after award of contractor to provide maximum production time for unit manufacture.
- G. The unit manufacturer shall provide initial factory start-up services for a period of not less than 16 hours on-site, plus a minimum of two follow-up site visits of not less than 2-hours on-site each.
- H. Custom built air handling units shall be horizontal type with coil requirements and fan capacities as listed on the drawings.
- I. Each air handling unit shall be complete with insulated casings, multiple, variable speed direct drive plenum fan array supply fans, and return/relief fans, internal spring type vibration isolation, stainless steel drain pans, heating coils, chilled water coils, return air acoustical plenum section with double wall construction and structural floor air filter media and frames, fan motors with adjustable bases, belt guards, and belt drives. The signal to control inverter drives will be received from the ATC contractor.
- J. Mixed air plenum and filter for all custom air handling units shall be provided with a waterproof drain pan and drain connection. Pan shall be piped to floor drain.
- K. Outside air and return air dampers shall be low leakage units similar to Ruskin CD-50 or approved equal.
- L. Sound Ratings:
  - 1. Each air handling unit shall be constructed and shall operate for all conditions of air flow (including full load to 30% of full load air flow for each unit serving variable air volume systems). Sound rating required for the completed installation shall be achieved with the air handling unit equipped with factory installed internal sound attenuators if required to meet acoustical criteria hereinafter designed, constructed and installed with the room construction as indicated on the Architectural and Structural Drawings for this Project and vibration isolation as indicated in these Specifications and on the Mechanical Drawings.
  - 2. The air handling unit manufacturer shall conduct testing to demonstrate the acoustical performance of the air handling unit specified. The acoustical measurements shall be made with a one-third octave band or octave band analyzer and w/the unit operating at 100%, 75%, 50%, 35% and 20% of design air flow capacity.

M. ACOUSTICAL PERFORMANCE: Sound Power Level @ 10 E-12 Watts

| BAND                        | 63 | 125 | 250  | 500  | 1000 | 2000 | 4000 | 8000 |
|-----------------------------|----|-----|------|------|------|------|------|------|
| Absorp Coefficient of Panel |    | .89 | 1.20 | 1.16 | 1.09 | 1.01 | 1.03 | .93  |
| Transmission Loss of Panel  | 26 | 23  | 30   | 42   | 51   | 59   | 58   | 58   |
| Fan Sound Data: (DB)        |    |     |      |      |      |      |      |      |
| (Intake)                    | 73 | 80  | 84   | 83   | 82   | 78   | 72   | 66   |
| At Discharge Opening        | 95 | 96  | 95   | 92   | 92   | 89   | 86   | 79   |

A. Unit Casings:

1. Units shall have 4" thick double wall construction with 18 gauge galvanized outer sheet and 22 gauge galvanized perforated inner sheet, solid liner at evaporative section for applicable units. Galvanized metal shall not be painted. Casing shall be reinforced and braced with steel angle framework. Casing shall consist of a fan section, a coil section or sections a discharge plenum with internal sound attenuators and outlet, and a stainless-steel drain pan as indicated on the Drawings. Suitable gaskets shall be provided at all joints between casing sections downstream of the fan. Stiffeners shall be provided, to prevent unit casing pulsation. The unit drain connection shall be a least 4" above the floor to the bottom invert of the stainless-steel condensate pipe. The unit casings shall not exceed the maximum dimensions shown on the Drawings.
2. Coil section shall completely enclose all connections, coil headers, and return bands. Coil frames shall not be used as structural members of the coil section. The entire cooling coil casing frame shall be stainless steel with the coil elevated above the lower condensate drain pan on stainless steel channel supports. The coil section shall be constructed in such a manner that the coils can be removed without affecting the structural integrity of the casing. Coil casing shall be constructed of stainless steel, and it shall have intermediate stiffeners and gaskets so there is no bypass air between the coil fins and the coil casing or between the coil casing and the drain pans.
3. The air handling manufacturer shall provide factory installed copper water piping unions, stop/balancing valves, test plugs, etc., within the unit. See typical coil piping detail on the Drawings. The piping internal to the unit shall be ASTM B-88-72 H23.1-59 Type L hard drawn copper water pipe and sized to limit the water velocity to be no more than 8 fps at design flow. All piping and fittings shall be soldered with Sil-Fos Stay-Brite. Internal piping shall be terminated at the side as indicated on the drawings. The internal piping shall be equipped with air seals at the casing penetrations similar to Kennard Industries Inc. flexible vinyl grommets.
4. The air handling unit manufacturer shall pre-wire the fan motor, temperature sensor, internal vapor-proof lights and switch on the outside of the casing for a complete pre-wired package. Unit wiring shall terminate in a NEMA 1 enclosure terminal panel with tagged terminal strips.

5. The lower stainless-steel drain pan or stainless-steel auxiliary drain pan shall extend under the complete chilled water coil section and all chilled water piping and shall be rigid and watertight with a 1-1/4" stainless steel pipe drain connection on the coil piping connection side. Drain pans installed on top of an insulated bottom panel shall be 16-gauge stainless steel and do not require insulation. The lower stainless-steel drain pan shall extend at least 24" beyond the leaving side of the coil and be pitched 5/8" toward the cooling coil and shall be constructed in a "V" section. The entire lower drain pan shall be sloped within the unit at least 1/2" toward the drain connection. Stainless steel 20-gauge intermediate drain pans which slope 1/2" back toward the leaving air side of the cooling coil shall be provided for all stacked chilled water coils which do not have internal drain troughs within the coil section. All intermediate drain pans shall be furnished with copper drain piping to transfer the condensate to the lower pan.
6. Unit evaporative section shall be 4' insulated panels with 316 stainless steel solid inner liner with drain pan, pump, and all components as specified.
7. Access door on the fan section shall be a minimum of 24" wide. The access door shall be hinged and allow for access to the fan and discharge coil section. The access doors shall be located so that the unit may be entered from the coil piping and access side of the unit, regardless of the mounting arrangement. Doors shall be equipped with Ventlok Style 310 latch and Ventlok Style 150 or KASON 1061 hinges or approved equal. All access doors shall have a padlocking feature. Door insulation shall be separate from unit insulation and shall be as specified for unit casing insulation.
8. The air handling unit casing shall have a field supplied and installed discharge plenum. The discharge plenum shall bolt to discharge side of the air handling unit and shall be gasketed at the joints. The discharge plenum shall have the same dimensions as the unit casing. The discharge plenum shall extend from the unit casing as required for supply air duct connections or a minimum of 36" horizontally or one fan diameter. The discharge plenum shall be equipped with internal sound attenuators as required to comply with the specified for the unit casing. The sheet metal discharge plenum shall provide the duct connections as shown on the Drawings. The static pressure loss of the internal sound attenuators shall be included in the internal static pressure loss of the air handling unit.
9. Unit casing, discharge plenum and return air plenum insulation shall be 4" thick, 1-1/2 lb. density glass fiber acoustical, noncombustible, vermin-and odor-proof and mildew resistant.
10. A return air plenum sound attenuating casing section shall be provided on the inlet of the air handling unit. The return air plenum shall extend from the air filters a minimum horizontal distance as shown on the Drawings. The return air plenum shall have the same dimensions as the unit casing. The plenum shall have double wall construction with perforated metal internal liner. The return air plenum floor shall be reinforced galvanized steel suitable for a walking surface with an integral structural frame with air handling unit. Openings from the equipment room to the unit shall be on the side of the plenum to facilitate servicing of the filters. The openings of the plenum shall be sized for a maximum face velocity of 1000 fpm.
11. The entire air handling unit shall be field installed by the Contractor on NRC ribbed neoprene pads so that the entire unit is pitched toward the drain connection at least 1/2" parallel to the face of the cooling coil. The condensate drain pan shall drain dry upon air handling unit shutdown. The air handling unit manufacturer shall indicate on the shop drawings the location and quantity of the neoprene pads for field installation by the Division 22, 23 Subcontractor.

B. Supply fans: (Unit supply fans shall be a fan array)

1. Performance ratings shall conform to AMCA Standard 205 (fan efficiency grade), 211 (air performance) and 311 (sound performance). Fans shall be tested in accordance with ANSI/AMCA Standard 210 (air performance) and 300 (sound performance) in an AMCA accredited laboratory. Fans shall be licensed to bear the AMCA certified ratings seal for both sound and air, and fan efficiency grade (FEG). Sound certification shall apply to both inlet and outlet sound power levels.
2. Fans shall have a sharply rising pressure characteristic extending through the operating range and continuing to rise beyond the peak efficiency to ensure quiet and stable operation. Fans shall have a non-overloading design with self-limiting horsepower characteristics and shall reach a peak in the normal selection area.
3. All fans shall be capable of operating over the minimum pressure class limits as specified in AMCA Standard 99.
4. Fans shall incorporate a non-overloading type backward inclined airfoil blade wheel.
5. A housing structure consisting of rigid, corrosion resistant, galvanized steel frame and exterior panels shall house the rotating assembly. The structure shall be capable of supporting multiple fan assemblies stacked upon one another and side-by-side without isolation between the independent units.
6. Fans shall be provided with a minimum of 2" acoustical insulation. Insulation shall be protected on the airstream side with a non-friable vapor barrier preventing insulation shedding for IAQ (indoor air quality). Galvanized, perforated steel shall be located on the airstream side of the vapor barrier providing additional protection without sacrificing air and sound performance. Rotating assemblies shall be internally isolated from the structural housing to achieve the least amount of transmitted vibration to the structure and/or air handling unit.
7. Motor pedestal and inlet panel shall be of reinforced, galvanized steel or enamel coated mild steel construction and integrated into a single, isolated assembly. Motor pedestal shall be designed to minimize vibration from the motor and wheel. The inlet panel shall incorporate a removable spun inlet cone designed for smooth airflow into the accompanying inlet retaining ring of the fan wheel. The inlet panel shall be isolated from the housing structure. Motors shall be provided with factory motor overload package with panel (motor overload box) for each tower.
8. Wheels shall have a non-tapered style blade retaining ring on the inlet side to allow higher efficiencies over the performance range of the fan. Wheels shall have airfoil-shaped extruded aluminum blades. All hollow blade wheels shall be continuously welded around all edges. Wheels shall have the optimum number of blades for the best sound quality. Wheel diameters shall be easily discernible by the fan size. All wheels shall be statically and dynamically balanced on precision electronic balancers to a Balance Quality Grade G6.3 per ANSI/AMCA 204 or better.

9. Steel components shall be thoroughly degreased and deburred before application of a rust-preventative coating. All galvanized and aluminum components shall be unpainted.

All fans prior to shipment shall be completely assembled and test run as a unit at the specified operating speed or maximum RPM allowed for the particular construction type. Maximum vibration shall be within the limits of ANSI/AMCA 204 Fan Application Category BV-3. Balance readings shall be taken by electronic type equipment in the axial, vertical, and horizontal directions on each of the bearings. Records shall be maintained, and a written copy shall be available upon request.

10. Fan Array:

- 1) The fan array manufacturer shall provide a complete system. All blank sections, fan septum components as required for end, top & bottom sections to fit plenum walls.
- 2) The fans in the array shall be wired to the motor overload panel(s). Wiring shall be in minimum Seal-Tite conduit and where multiple conductors are run, they shall be grouped together in a single conduit or enclosed raceway.
- 3) Fan array shall be wired to a single connection or VFD as required.
- 4) All fans shall be provided with a back-draft damper fitted to the downstream side of the fan.

11. AHU manufacturer shall be responsible to ensure that fans will perform at scheduled HP and ESP at both hot water, chilled water, economizer cfm, and at higher evaporative cooling cfm.

12. The manufacturer shall guarantee the workmanship and materials for its fan for at least one (1) year from startup or eighteen (18) months from shipment, whichever occurs first.

13. Fans shall be Twin City, Loren, Trane or approved equal.

C. Return/Relief Fans:

1. Performance:

- a. Performance ratings shall conform to AMCA Standard 205 (fan efficiency grade), 211 (air performance) and 311 (sound performance).
- b. Fans shall be tested in accordance with ANSI/AMCA Standard 210 (air performance) and 300 (sound performance) in an AMCA accredited laboratory.
- c. Fans shall be licensed to bear the AMCA certified ratings seal for both sound and air, and fan efficiency grade (FEG). Sound certification shall apply to both inlet and outlet sound power levels.

- e. Fans shall have a sharply rising pressure characteristic extending through the operating range and continuing to rise beyond the peak efficiency to ensure quiet and stable operation. Fans shall have a non-overloading design with self-limiting horsepower characteristics and shall reach a peak in the normal selection area. All fans shall be capable of operating over the minimum pressure class limits as specified in AMCA Standard 99.
2. Construction:
- a. Fans shall be designed without a scroll type housing and shall incorporate a non-overloading type backward inclined airfoil blade wheel, heavy-gauge reinforced steel inlet plate and structural steel frame.
3. Insulation:
- a. Fans shall be provided with a minimum of 2" acoustical insulation. Insulation shall be protected on the airstream side with a non-friable vapor barrier preventing insulation shedding for IAQ (indoor air quality).
  - b. Galvanized, perforated steel shall be located on the airstream side of the vapor barrier providing additional protection without sacrificing air and sound performance.
4. Frame and Inlet Panel:
- a. Inlet panels shall be of heavy-gauge reinforced steel construction.
  - b. The inlet panel incorporates a removable spun inlet cone designed for smooth airflow into the accompanying inlet retaining ring of the fan wheel. A square, formed lip suitable for attachment of a boot connector shall surround the unit.
5. Wheel:
- a. Wheels shall have a spun non-tapered style blade retaining ring on the inlet side to allow higher efficiencies over the performance range of the fan.
  - b. Wheels shall have airfoil-shaped extruded aluminum blades. All hollow blade wheels shall be continuously welded around all edges.
  - c. Wheels shall have twelve blades for better sound quality.
  - d. All wheels shall be statically and dynamically balanced on precision electronic balancers to a Balance Quality Grade G6.3 per ANSI/AMCA 204 or better.
6. Finish and Coating:
- a. The entire fan assembly shall be thoroughly degreased and deburred before application of a rust-preventative coating.
  - b. Aluminum components shall be unpainted.

7. Factory Run Test:

- a. All fans prior to shipment shall be completely assembled and test run as a unit at the specified operating speed or maximum RPM allowed for the particular construction type.
- b. Maximum vibration shall be within the limits of ANSI/AMCA 204 Fan Application Category BV-4. Balance readings shall be taken by electronic type equipment in the axial, vertical, and horizontal directions on each of the bearings.
- c. Records shall be maintained, and a written copy shall be available upon request.

8. Guarantee:

- a. The manufacturer shall guarantee the workmanship and materials for its MPQN fans for at least one (1) year from start up.

9. Application:

- a. Each bank of fans shall be factory wired to single point connection as required to control from a single VFD.
- b. Each motor shall be provided with shaft grounding kit factory installed.
- c. Each motor shall be provided with thermal overload protection, individually fused, and provided with its own disconnect.

10. Manufacturer:

- a. Fans shall be Twin City, Loren, Trane or approved equal.

D. Coils:

1. Coils shall be constructed with copper tubes with minimum of .035" thick walls and aluminum plate fins. Supply and return connections shall be on the same end of the coil. Fins shall be bonded to the tubes by means of mechanical expansion of the tubes.
2. The entire coils casing shall be stainless steel, air between the finned element and the coil casing anywhere along the entire length of the coil casing, shall have intermediate stiffeners if over 5'-0" length.
3. Coils shall have copper or brass pipe, cast iron, or cast steel headers as required for working pressure specified, and manual air vent connections except on those return connections where the coil header piping is designed to be self-venting. Coils shall have minimum one-half circuit configuration as required to meet the capacities at low water velocities.
4. Coils shall be tested by air pressure under water. Coils shall be tested a 1-1/2 times the specified pressure classification and as indicated on the riser diagrams, but the test pressure shall in no case be less than 250 psig, nor more than 500 psig.

5. Cooling/condenser water coil capacity shall be in accordance with chilled water flow and temperatures scheduled. Water velocity in the tubes shall not exceed five (5) feet per second and the water pressure drop through the coil shall not exceed 30 feet w.g. at design conditions. Water velocity in the tubes shall not be less than one foot per second at 36% of the design water quantity scheduled.
6. The cooling/condenser water coils shall be tested in accordance with ARI test procedures. The test of 100% capacity shall be with the design air flow and water flow, and the total heat transfer and leaving air temperature shall be determined. Capacities shall be corrected for altitude effects.
7. Coil calculations and selection data to ARI Standard 410 shall be submitted with Shop Drawings.
8. These Specifications set forth in the minimum requirements for cooling coils. Coils shall be Trane, RAE or Carrier.

E. Filter Frame:

1. Provide an integral extruded aluminum, galvanized or painted and bolted or welded filter retainer frames for the specified Type "A" filters unless otherwise specified. Frame shall be suitable to accommodate the specified filters at maximum filter face velocity of 500 fpm. Filter media for the air handling units shall be as specified.

F. U.V. Air Stream Disinfection System:

1. Standards:
  - a. Comply with UL Standard 900 as applicable to listing of air filters.
  - b. Comply with UL 984 – Safety Standards for Hermetic Motor Compressors.
  - c. Comply with UL/C-UL under Category Code ABQK (Accessories, Air Duct Mounted), UL Standards: 153, 1598 & 1995 respectively.
2. Delivery, Storage & Handling
  - a. Store UVC fixtures in a clean, dry place and protect from weather and construction traffic. Handle UVC Fixtures carefully to avoid damage to components, enclosures and finish. Leave factory-shipping covers in place until installation is complete. Do not install any damaged components; instead replace them and return damaged components to equipment manufacturer.
  - b. Comply with manufacturers' installation instructions regarding wiring and testing and to the drawings and/or specification regarding exact fixture placement for proper energy distribution.



3. UVC Appliances

- a. Germicidal UVC Lamps, Housings and mounting structure shall be of the single-ended, T5 tube type and be factory assembled and tested. Each UVC appliance shall consist of a lamp, lamp socket, and conduit with lamp to power supply leads, and a power supply (ballast). The support structure shall consist of a variable length mounting strut and mounting brackets. The mounting strut shall be capable of mounting the ballast, support the lamp, and provide apertures for the conduit and lamp leads. It shall be constructed to withstand the environments of HVAC equipment. The system shall provide for unobstructed (360 degree) UVC irradiance of the air stream. As alternative, for lamps mounted along the length of the duct, lamps may be mounted to existing structure or support channels supplied by others.

4. Power Supply:

- a. Power supplies shall be of a high efficiency, high frequency, high Power factor type with a universal input of 100 to 277 VAC, 50 to 60 Hz., matched to the lamp and designed to maximize radiance and reliability. They shall have four-wire lamp operation, rapid start, with pre-heat capability. They shall be UL Listed and labeled, and comply with FCC 47, Part 18, non-consumer limits requirements. The ballast shall be protected from failure in the event of end-of-lamp-life lamp failure. The ballast shall be capable of operation indefinitely when powered with no lamp or failed or broken lamp. The ballast shall have protection from a short circuit and over temperature protection with automatic reset. Each shall be capable of connection to a factory supplied mounting strut, equipped with a UL approved and NEC code compliant power connection, within a conduit, to the lamp. The power source shall maximize UVC, radiance and reliability and be UL listed for cold and/or moving air streams at temperatures ranging from 30° to 150° F and airflow velocities to 600 fpm.

1) Provide (1) additional ballast for each unit lamp for owner attic stock.

- b. The system shall allow for installation of the Power supplies within the struts or in a separate electrical enclosure outside the duct. For installations where support struts are not supplied the power supply shall be enclosed in a galvanized steel enclosure. Enclosure shall allow for easy mounting and connection terminal for input power.

5. Lamp Sockets:

- a. Sockets shall be constructed of UVC resistant, commercial grade HVAC materials designed for long service. The Lamp Socket shall accommodate a single ended four-pin, T5 diameter, 360° radiant lamp.

6. Lamp:

- a. Lamps shall be a high output (nominal 825 milliamps), T-5 diameter, hot cathode low pressure UVC lamp.
- b. Lamp tubes shall be constructed of quartz or Sodium Barium glass and internally coated, designed to extend lamp life and maintain output. Quartz lamps shall be doped to prohibit 185 nm emissions and shall produce no ozone. Undoped quartz lamp tubes shall not be acceptable.

- c. Teflon-sleeved lamps shall be offered as an option. Application of Teflon sleeve shall have the benefits of protecting the lamp from excessive cooling effects in an airstream and minimizing glass breakage.
- d. Lamps shall be equipped with a four-pin single ended lamp base. Wires from the end opposite the base shall be Teflon coated and rated at 600 volts.
- e. The lamp shall produce no less than 80% of its initial UVC output at "end of life." Lamp life shall be a minimum of 9000 hours of service.
- f. Each lamp shall contain no more than 8.0 milligrams of mercury.
- g. Lamps shall produce a minimum of 90% of its energy at 254nm UV at up to 600 fpm air velocity in temperatures from 55° to 135° F without production of ozone at levels stated by the manufacturer. Performance cures of the lamp at operating temperatures and air velocity shall be supplied by the manufacturer as required.
- h. Lamp performance shall be maintained with no more than a 20% output loss at the end of one year of continuous use.
  - 1) Provide (2) additional lamps for each lamp/unit provided for owner attic stock.

7. Support Structure:

- a. Support Structure shall consist of one or more metal struts that shall be mounted via brackets to the ceiling and floor of the plenum or duct. Struts shall contain integral wire ways and covers to allow connection of multiple fixtures to a single power supply lead. Support struts shall be adjustable to accommodate the plenum or duct height. Supports shall have knock-outs to provide for the mounting of the lamps, power supplies (ballast) and lamp connection conduit at multiple locations.

8. Performance:

- a. Each lamp appliance as submitted shall be independently tested to verify output under the variable operating conditions typically found in HVAC equipment.
- b. The UVC system shall be tested to verify performance and conformity to UL/C-UL standards included in UL Category Code ABQK (accessories, Air Duct mounted) Performance.
- c. Irradiation – Lamp appliance and support structure are to be installed allowing for multiple rows and in lamp lengths necessary to cover the full width of the duct or plenum. As alternative, lamp appliance and support structure can be installed as necessary to cover the length of the duct or plenum.
- d. When installed, the average irradiance throughout the moving air stream within the UV irradiation zone shall be sufficient to disinfect a specific micro-organism(s) at a rate of 75% or higher upon the first pass. Additionally, an URV rating, as defined by the IUVA, shall be determined for first-pass disinfection in the installed location.

- e. The manufacturer shall be capable of supplying irradiation, intensity, and UV dosage calculations or modeling to determine fixture placement, energy distribution, URV rating, and projected disinfection rates as required. This shall determine the overall effectiveness of the UVGI system performance.

9. Warranty:

- a. All components shall be warranted to be free from defects for a period of one year. Lamps shall have a minimum of 80% of new lamp output at the end of 9000 hours.

10. Approved Manufacturers:

- a. Ultraviolet Devices, Inc.; Altru-V products, or approved equal.

11. Quality Assurance:

- a. UVC products shall be from an ISO 9001 manufacturer or the supplier shall provide proof of 100% inbound and outbound testing of equipment.

12. Installation of UVC Fixtures:

- a. Coordinate with the installation of HVAC equipment as indicated above after such HVAC equipment is properly installed. Field install all UV fixtures per manufacturer's guidelines.
- b. Comply with the safety standards specified in the ASHRAE Handbook "Systems and Equipment", Chapter 60. At a minimum, provide a disconnect switch and a safety interlock switch on all access panels and doors leading to the UVC assembly and/or within view of the fixtures to assure that the UVC assembly will be de-energized when any of these accesses are opened.
- c. Install Caution Labels on all access doors and removable panels within sight of the Fixtures.
- d. Test operation of lamps and safety switches.

13. General Requirements:

- a. Shop Drawings shall indicate specifically that the construction, fabrication, etc., of the units to be furnished comply with these Specifications.

2.12 AIR-COOLED CONDENSING UNIT (CU-1) Remote to AHU-4

- A. The dual circuit remote unit condensing unit shall be provided to match cooling capacity specified to corresponding rooftop unit. Condensing unit shall be fully enclosed with protective factory louvers.

- B. Unit shall have a single digital scroll compressor for each circuit with multiple capacity steps. Each compressor shall be R-134A type with suction cooled motor windings. Each compressor shall have suction and discharge service valves, oil sight glass, positive displacement reversible oil pump, and liquid line solenoid valve for pump down off cycle. A manual pump down switch shall be installed for use during service. Each compressor shall be provided with spring isolators and shall include vibration isolators in discharge and suction lines. Each compressor to be provided with a crankcase heater that is independently fused and will remain energized at all times unless unit is disconnected at main power source. Braided stainless steel lines shall be used for all refrigeration pressure switches.
- C. The condenser coils shall be aluminum fins on expanded copper tubing. Fin spacing shall not be more than twelve (12) fins per inch and a minimum of four (4) rows deep. Condenser coils shall be tested at 425 PSIG and shall be mounted vertically for complete surface utilization. Condensers shall be counter flow and designed for optimum liquid sub-cooling.
- D. Condenser fans shall be direct drive and shall be of the number and size as scheduled. Motors shall be three phase, integral horsepower type of NEMA construction standards, and shall not exceed 1140 RPM. Motors shall have permanently lubricated ball bearings and not less than NEMA class "B" insulation. Condenser fans shall be of heavy-duty construction, utilizing a plated steel hub on the exhaust side of the fan and secured with square head set screws keyed to a stainless-steel motor shaft. Fan outlets shall have heavy-duty zinc plated/vinyl dipped wire guards.
- E. Condenser coils shall be provided with hail/vandalism screens. Screens shall be constructed of expanded aluminum mesh cross-broken for rigidity and shall cover entire coil surface. Screens shall be easily removable slide-in type. Screens that require dismantling or disassembly for removal shall be unacceptable.
- F. Units shall be Trane, York, Energy Labs, Carrier or approved equal.

#### 2.13 EVAPORATOR COIL SECTION

- A. Direct expansion refrigerant coils shall be furnished according to the capacities scheduled. Coils shall be aluminum fin on expanded 5/8" copper tubing and a minimum of four (4) rows deep, or as required with a maximum fin spacing of twelve (12) fins per inch. Refrigerant flow to coils shall be controlled with externally equalized thermal expansion valves on each circuit.
- B. A stainless steel IAQ compliant drain pan, sloped in direction of airflow, shall be provided. Drain pan shall be of double wall construction and shall be fully insulated. Drain pan shall be provided with two (2) 3" MPT condensate drain connections. Condensate drain connections shall exit each side of drain pan at the lowest point of the bottom of the drain pan. Condensate drain connections shall exit through unit structural steel base frame. Condensate drain connections that exit the side if the drain pan shall not be acceptable.

#### 2.14 REFRIGERANT CIRCUITS

- A. All refrigerant piping shall be ACR copper with nitrogen purged, silver alloy brazed connections properly supported and provided with heavy-duty pipe clamps and isolation grommets where pipes pass through bulkheads. The complete system shall be factory evacuated, and pressure tested prior to being charged with R-134A. Each refrigerant circuit shall include moisture indicating sight glass, replaceable core liquid filter/drier, replaceable core suction line filter, liquid line isolation ball valve, high pressure relief valve at condenser outlet and liquid line solenoid valve to allow pump down of refrigerant. Gauge connection ports shall be provided on compressor and liquid line. Schraeder type refrigerant access fittings shall be provided on each condenser coil inlet and outlet and between each refrigerant component.

- B. Compressor cylinder unloading, temperature activated, shall be provided on each compressor.
- C. Hot gas bypass capacity control, with suction activated regulating valve and isolation ball valve, shall be provided on lead compressor.

#### 2.15 VARIABLE FREQUENCY DRIVES

- A. Furnish and install complete with roof-top air handling units the variable frequency - variable speed motor drives for the various fans requiring variable speed controls.
- B. Variable frequency drives shall be provided for the supply air fan motors and the return/relief air fan motors for rooftop units. Individual drives are required for each motor. Drives shall be mounted in unit by manufacturer. Coordinate location with electrical.
- C. Variable frequency drives are required for heating and chilled water pumps. Located in Boiler Room.
- D. Variable frequency drives shall be same manufacturer throughout project and shall be matched to the motor which they control by the V.F. drive manufacturer to insure maximum performance and minimum generation on both noise and electrical interference.
- E. All V.F. drives shall be furnished with Auto/Off positions.
- F. Factory start-up services shall be provided for all V.F. drive systems. A start-up report on each V.F. drive shall be included in the O & M manuals.
- G. V.F. drives shall have integral current limiting devices.
- H. V.F. drives shall not generate noise levels which are objectionable under normal operating conditions.
- I. V.F. fan drives shall not excite the natural frequency of the fan/drive assembly, or otherwise create vibration related situations which are objectionable.
- J. V.F. drives shall be internally protected against noise, or line transients, superimposed on the powerline.
- K. All V.F. drives shall conform to IEE519 standard for level of harmonic filters.
- L. Testing per IEE519 shall be performed and results and adjustments included in the project O & M Manuals.
- M. Drives shall have the following features:
  - 1. Input power requirements 480 VAC +/- 10, 60 HZ.
  - 2. Output power requirement three phase 60 HZ.
  - 3. Operating ambient temperature 32 deg. F to 104 deg. F.
  - 4. Frequency stability - The output frequency shall not vary with load nor with any input frequency variation.
  - 5. Speed Control - The output frequency shall be adjusted in proportion to a 3-15 psi signal input from the duct static pressure controller.

6. Start/Stop Control - The MCC starter shall start and stop the variable speed drive.
7. Indicating lights -
  - a. Power on
  - b. Zero speed
  - c. Enabled
  - d. Over temperature with alarm contacts
  - e. Current limits
  - f. Undervoltage with alarm contacts
  - g. Overvoltage with alarm contacts
  - h. Overcurrent with alarm contacts
  - i. Driver module proper function leads (2 each module)
8. Speed reference signal - 0-5 VDC.
9. Protection circuits - Shut down shall occur for any of the following:
  - a. Input voltage in excess of plus 12% of rated voltage.
  - b. Input voltage in excess of -15% of rated voltage.
  - c. CD bus voltage in excess of 1000 VDC.
  - d. Output current rating excess.
  - e. Loss of any one phase under full load.
  - f. Internal temperatures of the control reach critical.
  - g. A phase-to-phase short appears at the motor output terminals.
10. Automatic Restart - The controller shall automatically restart after a protective circuit trip and the cause of the trip has cleared. The auto restart shall be attempted five times to restart the fan. If, after the 5th start the failure still exists, the controller shall remain off until manually reset and the trouble condition corrected. Each attempt shall begin at the zero speed and accelerate to the speed command signal input at a rate set by the acceleration current limit circuit.
11. NEC Requirement -
  - a. A fused disconnect switch or MCP (furnished under Division 23) shall be installed in the vari-drive input power lines, rated for input voltage and current.
  - b. The vari-drive shall be equipped with its own input fuse block section.
  - c. Power wiring from the MCC starter to the vari-drive disconnect, from the disconnect to the vari-drive, and from the vari-drive to the air handling unit or pump motor shall be wired per the NEC, State, and local codes. Power wiring and conduit shall be furnished by the contract electrician under Division 26.

N. Drives shall be Mitsubishi, ABB or approved equal.

## 2.16 UNIT HEATERS

- A. Furnish and install in the locations shown on the plans a propeller fan unit heater of the type and rating specified. Each unit to have capacity, air delivery, and motor characteristics as shown on the schedule and shall be for the duty as shown on the plans.

- B. Unit heater coils shall be constructed of copper tubes with .035" thick walls, plate-type aluminum fins and steel headers. Tubes shall be expanded into the integral fin collars. The complete assembly shall be tested at 500 pounds hydrostatic pressure. Adequate provisions shall be made for expansion and contracting of coils within the casing.
- C. Unit casings shall be of not less than 16-gauge steel. All casings to be phosphatized for rust resistance and finished with a baked enamel. All hard shall be plated for rust resistance.
- D. Motors and fans shall be designed for unit heater service and shall be tested for continuous duty as applied on each size to eliminate vibration and minimize sound. Heater design shall incorporate means for adequately cooling the motor when heat is on but the fan is not operating.
- E. Horizontal delivery units shall be equipped with formed louvers, 4-way individually adjustable.
- F. Vertical delivery units shall be provided with the diffuser specified.
- G. Unit heaters shall be Airtherm, Trane, Erincraft, or Modine.

#### 2.17 HEATING AND CONDENSER/COOLING WATER COILS

- A. Furnish and install the condenser/cooling and heating coils of capacities as shown and specified on the drawings.
- B. Coils shall be of the extended surface type, fabricated of copper or brass tubing not less than 5/8" diameter with .035" thick walls and plate-type fins of copper or aluminum extending at right angles to the centerline of the tubes. Pressure parts of the coils shall be constructed and tested for a working pressure of not less than 200 psig.
- C. Each coil section shall be mounted in a die-formed, 16-gauge, zinc-coated steel casing with mounting flanges.
- D. All coils shall have inlet, outlet, vent and drain connections for each section and shall have all connections at the same end.
- E. Coils shall be Carrier, York, Trane or RAE.

#### 2.18 HOT WATER BASEBOARD RADIATION

- A. Furnish and install complete the bare tube or enclosed hot water baseboard radiation shown on the drawings and specified herein.
- B. Enclosures shall be fabricated of 16-gauge steel. They shall contain double formed "Z" flange at bottom edge of enclosure to fit securely into "Rota-Cam" lock slot of element and cover support. Special foot on cover supports shall hold cover firmly in slot without the use of screws or latches. Provide continuous full back panel at enclosure top. Louvers shall be provided for the full length of the enclosure. Where elements are not used, provide blank enclosure.
- C. Continuous turning, jam-proof dampers shall be provided at elements only. Damper shall have operating mechanism of sturdy screw-machine parts, designed so that overturning at fully opened or closed position will not cause damage. Knobs shall be knurled aluminum with Allen head retaining pin into damper shaft with open-closed directional arrows.

- D. Provide neoprene gasket for mounting on enclosure sleeves to complete wall to wall installation. Sleeves shall not overlap enclosure louvers.
- E. Radiation elements shall be Vulcan, Trane, Airtherm or Sterling.

## PART 3 – EXECUTION

### 3.1 COORDINATION

- A. All equipment and piping shall be arranged to allow for easy maintenance and access to service valves.
- B. Provide valves and unions or flanges at all pieces of equipment to allow maintenance.
- C. Install all automatic valves, sensor well, flow switches, etc., as directed by the control contractor.

### 3.2 EXPANSION JOINTS

- A. General: Provide expansion joints, guides, and anchors where indicated on the drawings or where required to relieve excessive stress in piping systems. Joints shall be installed in strict accordance with manufacturer's installation instructions.
- B. Construction: Construct offsets with pipe and long turn factory-made welded fittings sized to limit the stress in any part of the loop or piping system to the values in ANSI B31.1. Use ASTM A 53 pipe and fittings.

### 3.3 INSTALLATION OF PUMPS

- A. General: Install pumps where indicated and in accordance with manufacturer's published installation instructions.
- B. Support: Install floor mounted pumps on minimum of 4-inch high concrete base. Provide anchor bolt inserts poured in place. Pumps shall be mounted with cap screws. Grout pump base level.

End of Section



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**DIVISION 23 – HEATING, VENTILATING, AND AIR  
CONDITIONING (HVAC)**

|                 |                             |
|-----------------|-----------------------------|
| Section 23 000  | Heating Cooling             |
| Section 23 0100 | General Provisions          |
| Section 23 0501 | Testing                     |
| Section 23 0593 | Balancing                   |
| Section 23 0800 | System Commissioning        |
| Section 23 0900 | Basic Materials and Methods |
| Section 23 3000 | Air Distribution            |

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## SECTION 23 0100

### GENERAL PROVISIONS

#### PART 1 – GENERAL PROVISIONS

##### 1.1 GENERAL CONDITIONS

- A. The contractor shall carefully read the General Conditions of the Contract and all information to bidders which, with the following specifications for heating, cooling, plumbing, exhaust ventilation, and temperature control are a part of the Contract.

##### 1.2 BASIC BID

- A. Shall include all labor and materials specified in this division. The term "furnish" and/or "install" or similar implication shall mean "furnish and install complete."

##### 1.3 SCOPE OF WORK

- A. The work to be done under this section includes the furnishing of all labor, materials, equipment, controls and accessories required to complete all heating, air conditioning, ventilating, plumbing, drainage, heat recovery, and other mechanical systems as shown on plans and/or described in these specifications, including miscellaneous items required to provide a complete and functional facility.

- B. Work shall include, but shall not be necessarily limited to, the following:

1. System commissioning
2. Testing
3. Balancing
4. Insulation systems
5. Roof drain system
6. Air distribution system
7. Hot water heating systems
8. Exhaust systems
9. Automatic control systems
10. Air conditioning system
11. Plumbing systems
12. Special systems

- C. The mechanical contractor shall provide all miscellaneous electrical work and control wiring for special systems where the wiring requirements are provided by the equipment manufacturers and/or suppliers, unless all of the required wiring is clearly shown on the electrical drawings to be provided by the electrical contractor.

##### 1.4 **See specifications section 230100-10.3.3.E & 230100-10.3.3.F for factory training requirements.**

##### 1.5 CODES AND ORDINANCES

- A. All work shall be installed in accordance with the city, state, and local plumbing codes, and all other codes, ordinances, and regulations which govern the type of work covered by these specifications.

- B. Should the drawings conflict with the code, the code shall govern the proper installation of the work, and no extra charge shall be made for such change.
- C. Should the contractor perform any work that does not comply with the requirements of the applicable building codes, state laws, local ordinances, industry standards, or utility company regulations, he shall bear all costs arising in correcting the deficiencies.
- D. Where the work required by the drawings and specifications exceeds the minimum code requirements, the work shall be done as shown or specified.
- E. NOTE: Code compliance, or similar terminology, shall be interpreted to mean "the interpretation of the code as enforced by the local building authority".

#### 1.6 DRAWINGS AND SPECIFICATIONS

- A. These specifications are intended to cover all labor, material, and standards of mechanical workmanship to be employed in the work shown on the drawings, called for in these specifications, or reasonably implied by terms of same. The drawings and specifications are intended to supplement one another, and any part of the work that may be mentioned in the one and not represented in the other shall be done the same as if it had been mentioned or represented in both.
- B. Large scale drawings shall take precedence over layouts and small-scale details.
- C. The mechanical drawings are schematic in nature, and show the general arrangement of all piping, ductwork, mechanical equipment, and appurtenances. They shall be followed as closely as the actual building construction, and the work of other trades will permit.
- D. Due to tight structural conditions and space limitations in selected areas the contractor should anticipate structural and space conflicts and shall make allowances for them in his bid. Until the steel fabrication shop drawings are submitted for review, the mechanical coordination cannot be completed.
- E. The architectural and structural drawings shall be considered part of the mechanical work insofar as these drawings furnish this Division with information relating to design and construction of the building. Architectural and structural drawings take precedence over the general building layouts and details shown on the mechanical drawings.
- F. The structural engineer and architect shall approve all attachments to or modifications of any structural members in the building required for installation of the mechanical systems.
- G. Because of the small scale of the mechanical drawings, it is not possible to indicate all offsets, fittings, and accessories which will actually be required. This contractor shall investigate the structural and finish conditions affecting the work and provide all necessary offsets, fittings, valves, trim, and accessories required to meet actual job-site conditions.

##### 1. Dimensions -

- a. Verify dimensions governing mechanical work at the building. No extra compensation shall be claimed or allowed on account of differences between the actual job-site dimensions and those indicated on the drawings.

2. Adjoining work -

- a. Examine all adjoining work on which the mechanical work is dependent and report any work which must be corrected. No waiver of responsibility shall be claimed or allowed due to failure to report unfavorable conditions affecting the mechanical work.

1.7 INTERPRETATION OF DRAWINGS AND DOCUMENTS

- A. If any person contemplating submitting a bid for the proposed contract is in doubt as to the true meaning of any part of the plans, specifications, or other proposed contract documents, or finds discrepancies in or omissions from the drawings or specifications, he may submit to the Owner's representative, a written request for an interpretation or correction thereof. The person submitting the request will be responsible for its prompt delivery. Any interpretation or correction of the proposed documents will be made only by addenda duly issued, and a copy of such addenda will be mailed or delivered to each person receiving a set of such documents. The Owner will not be responsible for any other explanations or interpretations of the proposed documents. All questions shall be submitted at least seven days in advance of bidding.
- B. The Owner's representative will interpret the meaning of any part of the drawings and specifications about which any misunderstanding may arise, and his decisions will be final. Should there appear to be any error or discrepancy in or between the drawings and specifications, the contractor shall refer the matter to the Owner's representative for adjustment before proceeding with the work. Should the contractor proceed with the work without so referring to the matter, he does so on his own responsibility.

1.8 WORKMANSHIP

- A. Workmanship shall be the best quality of its kind for the respective industries, trades, crafts, and practices, and shall be acceptable in every respect to the Owner's representative.

1.9 SUBSTITUTIONS

- A. See Special Conditions pertaining to Substitutions.
- B. Requests for prior approval must be submitted to owner's representative a minimum of five working days prior to bid date.

1.10 FEES & PERMITS

- A. This contractor shall obtain all necessary permits and pay all fees required in connection with the work.
- B. Requirements of the local utility companies shall apply at the time of bidding. The contractor shall have checked with the local utility companies, and shall determine from them all valves, boxes, meter boxes, and meters which they will require to be installed, and shall figure cost of same in his bid. Utility connection fees will be paid by the Ogden School District.
- C. Division 21, 22, 23, and 25 contractors shall be responsible for fees, permits, and scheduling of the state boiler inspector for all required items.
- D. Site utility contractor shall provide water meter and meter box as required by local water department.

#### 1.11 SITE INSPECTION AND EXAMINATION OF DRAWINGS

- A. The contractor shall carefully study all drawings and specifications pertaining to the work. If any of the work as laid out, indicated, or specified is contrary to or conflicts with any governing ordinances or regulations, the same shall be reported to the Owner's representative before submitting a bid. The Owner's representative will then issue instructions as to the procedure.
- B. The contractor shall carefully examine the building site and compare the drawings with existing conditions. By the act of submitting a bid, the contractor shall be deemed to have made such examination, to have accepted such conditions, and to have made allowance therefore in preparing his bid.

#### 1.12 VERIFICATION OF DIMENSIONS

- A. Before proceeding with any work, the contractor shall carefully check and verify all dimensions, sizes, etc., and shall assume full responsibility for the rigging and fitting-in of his ductwork, piping, and equipment. Where apparatus and equipment has been indicated on the drawings, dimensions have been taken from typical equipment of the class indicated. The contractor shall carefully check the drawings to see that the equipment he is required to install will fit into the spaces provided and will allow for proper maintenance and service of the equipment.

#### 1.13 COORDINATION

- A. This contractor shall coordinate his work with other specification divisions and shall provide all necessary specialty items, trim, and incidental 115 volt and 24-volt power and control wiring (which is not shown or specified under other divisions) required to provide a complete functional acceptable system.
- B. The Division 21, 22, 23, and 25 contractors shall coordinate his work such that all slots and openings through floors, walls, ceilings, and roofs are properly located and shall do any cutting and patching caused by neglecting to do so.
  - 1. Furnish sleeves, inserts, supports, and equipment that are to be installed by others in sufficient time to be incorporated into the construction as the work proceeds.
  - 2. It is the responsibility of Division 21, 22, 23, and 25 to locate these items and see that they are properly installed.
- C. The locations of all piping, ducts, apparatus, and equipment indicated on the drawings are approximate only, and shall be changed as required to meet the actual architectural and structural conditions at the job site. All changes shall be approved by the Owner's representative. Any change in work which has not been installed shall be made by the contractor without additional compensation, except changes which are caused by architectural and structural changes which substantially increase the size of any of the mains, or which substantially increase the number of fixtures or length of pipe runs. Any and all changes shall be made only upon approval of a written change order.
  - 1. Right of way - Lines which pitch shall have the right of way over those which do not pitch. For example, plumbing drains shall normally have right of way. Lines whose elevations cannot be changed shall have right of way over lines whose elevations can be changed.
  - 2. Offsets, transitions, and changes in direction in pipes and ducts shall be made as required to avoid conflicts with building footings and foundations or other buried ducts or utilities, and to maintain proper head room and pitch of sloping lines whether or not indicated on the drawings. Furnish and install all traps, air vents, sanitary vents, and devices as required to affect these offsets, transitions and changes in direction.

- D. It shall be each contractor's responsibility to verify exact location, elevation, and/or route of the various mechanical system components with architectural details and with Owner's representative's personnel on job.
- E. Where deviations from locations and/or arrangements described are necessary to meet actual job conditions, the changes shall be made without cost to the Owner.
- F. The Owner's representative reserves the right to make any reasonable change in location of any outlet, piping, or equipment, before installation, without additional cost.

#### 1.14 LOCATION OF CEILING OUTLETS

- A. This contractor shall assist the Owner's representative, General Contractor, Electrical Contractor and other interested parties in the establishment of room centerlines, axis of rooms and all walls.
- B. All grilles, registers, ceiling diffusers, etc. shall be located with reference to these established data points.
- C. These outlets shall be referenced to such features as room centerlines, walls and ceiling furrings, balanced border widths, etc.
- D. Outlets in acoustical tiles, panels, etc. shall occur in joints or centers of whole pieces, etc.
- E. The final determination of the exact location of all outlets shall be subject to the direction and approval of the Owner's representative.

#### 1.15 PROVISIONS FOR REMOVAL & ADEQUATE CLEARANCE

- A. Install Mechanical work to permit removal of heating and cooling coils, filters, belt guards, sheaves, drives, and other parts requiring periodic replacement or maintenance without damage to or interference with other parts of equipment or structure.
- B. Arrange pipes, ducts, and equipment to permit ready access to filters, valves, cocks, traps, starters, motors, control components, and to clear the openings of swinging doors and access panels.

#### 1.16 RECORD DRAWINGS

- A. The contractor shall maintain one set of record drawings. These prints shall show the location, elevations and details of all items of work installed under this contract. Buried piping shall be located by dimensions from foundation walls and depths of bury shall be indicated. These shall be marked in red. The completed set of record drawings must be submitted to the Owner's representative before the contractor is eligible to receive the final payment. An up-to-date record set of drawings shall be maintained during the progress of the project, and be available to the Owner's representative upon request.

#### 1.17 COORDINATION DRAWINGS

- A. The contractor shall provide coordination drawings, when requested by the Owner's representative, to ensure that the various mechanical system components are coordinated with each other, and with other building systems.
- B. The coordination drawings shall be drawn to scale (usually 1/4" = 1'-0") and shall show all systems as they relate to each other, especially in areas of potential conflict.



- C. Equipment room coordination drawings shall include, in addition to the information specified, the size and location of all piping, pipe fittings, valves, strainers, specialties, flexible connections, water treatment devices, control panels, etc., and their installed elevation.
- D. Equipment room coordination drawings shall show the location of all pertinent electrical outlets, lights, panels, transformers and switch gear, and their required clearances from duct, piping, and equipment, and for maintenance access.
- E. Footing and foundation coordination drawings shall be prepared showing the exact location, depth, and slope of all buried piping to be installed. These coordination drawings shall include all sand and grease interceptors, drains in depressed slab areas, and all necessary buried water piping.
- F. This set of foundation coordination drawings shall be maintained in the construction trailer and shall be marked up daily to indicate exact location and elevation of all buried piping and conduit systems.
- G. Coordination drawings shall be professionally drafted and shall be clear and concise in their presentation and clarity.
- H. All coordination drawings shall be prepared in digital format in the latest version of Revit. Material shall be submitted in both printed and digital form.
- I. All ductwork and piping attachments to the building structure shall be detailed and shall be coordinated with the Owner's representative.

#### 1.18 COOPERATION WITH OTHERS

- A. The contractor shall so organize the work that progress will harmonize with the work of all trades, so that all work may proceed as expeditiously as possible. The contractor shall be held responsible for any delays which might be caused by his negligence or failure to cooperate with other contractors or crafts.

#### 1.19 FOREMAN

- A. A full-time foreman shall be designated by the contractor to the Owner's representative and shall be available on site for consultation. This individual, when appointed, will not be replaced without prior approval from the Owner's representative. The foreman shall be responsible for the coordination and correct placing of the work.

#### 1.20 GUARANTEE

- A. By the acceptance of the contract award for the work herein described, the contractor assumes the full responsibility imposed by the guarantee as set forth herein and should protect himself through proper guarantee from equipment and specialty manufacturers and subcontractors as their interests may appear.
- B. All materials and equipment provided and installed under this division of the specifications shall be guaranteed for a period of one (1) year from the date of substantial completion and acceptance by the Owner, unless specifically noted elsewhere in the specification. Should any trouble develop during this period due to defective materials or workmanship, the contractor agrees to correct the trouble without any cost to the Owner, any defect noticed at the time of installation and/or during the guarantee period shall be corrected immediately to the satisfaction of the Owner.

## 1.21 SCHEDULES, MATERIALS AND EQUIPMENT

- A. As soon as practicable, and within 30 days after date of award of contract, and before commencement of work, a complete schedule of equipment and materials proposed for installation shall be submitted to the Owner's representative. The schedule shall include catalogs, cuts, drawings, and such other descriptive data or samples that are requested by the Owner's representative. Schedules shall include all items of equipment used. No partial submittals will be accepted.
- B. Provide complete, corrected shop drawing of each required equipment & material to the Owner's representative for review, approval. DO NOT SUBMIT without the general contractor's signed stamp, indicating the general contractor has reviewed the submittal for completeness and conformance to the Contract Documents.
- C. Submittals shall be complied by division and shall be a complete submittal. Partial submittals will be rejected.
- D. Inform the Owner's representative by notation, or in the letter of transmittal, of any proposed deviation from the requirements of the Contract Documents.
- E. Provide required shop drawings or other submittals within time stipulated on approved progress schedule.
- F. Do not commence work requiring a shop drawing or other submittal until approval of the required submittal has been received. Such approval will be based upon a review only for conformance with the design concept of the project and with the information given in the Contract Documents, and does not relieve the contractor from responsibility for errors or omissions in the shop drawings.
- G. Schedules shall be complete and shall be completely indexed by division, and shall include the following items, as well as all material, etc. for a complete project submittal:
  1. Boilers
  2. Heating coils
  3. Cooling tower
  4. Cooling coils
  5. Evaporative cooler sections
  6. Pumps and circulators
  7. Valves
  8. Hot water & chilled water specialties
  9. Flow meters
  10. Water heaters
  11. Piping systems
  12. Pipe supports & restraints
  13. Rooftop units
  14. Air handling units
  15. Unit heaters
  16. Fan coil units
  17. Baseboard radiation
  18. Pressure gauges & thermometers
  19. Plumbing fixtures
  20. Supply air fans
  21. Exhaust air fans
  22. Ventilation air fans
  23. Filter banks

24. Dampers
25. Louvers
26. Medium pressure ducts
27. Medium pressure fittings
28. Medium pressure flexible ducts
29. Low pressure flexible ducts
30. Grilles & registers
31. Diffusers
32. VAV reheat boxes
33. PRV stations
34. Water softener
35. Insulation systems
36. Vibration isolators
37. Seismic restraints
38. Automatic temperature controls
39. Air balance contractor qualifications
40. System commissioning contractor's qualifications
41. Fire safing system with installation diagrams
42. Other schedule items

H. Submittals received which do not contain all of the above items will be returned unchecked.

I. Purpose and Contractor's Responsibility:

The purpose of the final submittal is to "assist the contractor in selecting the equipment." The contractor shall review the submittals prior to submission to the Owner's representative to make sure that the submittals are complete in all details including the following items:

1. Manufacturers' names shall be mentioned in specifications as accepted by Owner at time of bidding.
2. Equipment dimensions shall be verified to fit the spaces provided with sufficient clearances, as may be required by the equipment or indicated on the drawings.
3. Equipment shall be reviewed with respect to schedules, specifications, plans and details.
4. Equipment submittal sheets shall be clearly marked indicating equipment symbol and exact selection of proposed equipment.

J. Review:

Review and acceptance of submittal does not relieve the contractor of his responsibility to fulfill the contract requirements. Review and acceptance of the submittal will not be used as a means of changing the contract requirements. Items not covered in the accepted submittal, or items incorrectly covered but not recognized or identified, shall not be used when contrary to the requirements of the contract documents.

K. Acceptance of Substitute Equipment:

If the proposed installation is approved, this contractor shall make all incidental changes in piping, ductwork, supports, installation, wiring, heaters, panel boards, and as otherwise necessary. Provide any additional motors, valves, controllers, fittings, and other additional equipment required for the proper operation of the system resulting from the contractor's selection of alternate equipment, including all required changes in the effected trades.

L. Owner's Refusal Right:

In the event that items submitted are substitutions for specified items and are found to be not acceptable, the right shall be reserved to require the specified items.

1.22 OPERATING INSTRUCTIONS AND CATALOG INFORMATION

- A. This prime Division 23 contractor shall compile digital catalogs of every product used by him and subcontractors in the completion of the work. The digital catalog shall also include copies of the test data (Section 230501), balancing reports (Section 230593), and system commissioning data (Section 230800). Before final acceptance by the Owner's representative, he shall turn over to the Owner this compilation of catalog data. A double index shall be provided, one giving an alphabetical list of products for which catalogs are included, and one giving their addresses, whose products are included in the work. Provide data for each item of equipment listed in SCHEDULES, MATERIALS & EQUIPMENT, as shown in Section 230100. Provide copy of submittal data. All products shall be assembled by Division.
- B. Complete digital copies shall be delivered to the Owner's representative for his approval.
- C. Provide warranty schedule and schedule of overload protection as required in Section 230800.
- D. Manuals not in compliance will not be reviewed and will be rejected.
- E. Manual shall be identified as follows:

OSD HILLCREST ELEMENTARY SCHOOL REPLACEMENT  
OGDEN SCHOOL DISTRICT  
OPERATING & MAINTENANCE MANUAL  
2024-2025  
SET #

PART 2 – PRODUCTS

2.1 MATERIALS, EQUIPMENT AND ACCESSORIES

- A. Unless otherwise specified, all equipment, accessories, and materials shall be new and undamaged, and the workmanship shall be of the best quality for the use intended and shall be acceptable to the Owner's Representative.
- B. Equipment, accessories, and materials shall be essentially the standard products of the manufacturer, or as specified herein. Where two or more units of the same class of new equipment are required, these units shall be products of a single manufacturer.
- C. Should mechanical equipment other than that used in the design be furnished, it shall be the responsibility of the mechanical subcontractor to provide large scale (1/2" = 1'-0") installation drawings, as required, showing service and maintenance points with proper clearance allowances for service.
- D. All equipment shall be selected to deliver full rated capacity at the job site elevation.

## PART 3 – EXECUTION

### 3.1 FUNCTIONING AND OPERATION OF EQUIPMENT

- A. Contractor's Responsibility:
- B. Installation and startup shall be so made that its several component parts will function together as a workable system and shall be left with all equipment properly adjusted and in working order.

### 3.2 CLEANING AND PATCHING BY MECHANICAL CONTRACTOR

- A. The contractor shall remove all stains or grease marks on walls, floors, glass, hardware, fixtures, or elsewhere, caused by his workman or for which he is responsible. He shall remove all stickers on plumbing fixtures, do all required patching up and repair all work of others damaged by this division of the work, and leave the premises in a clean and orderly condition.

### 3.3 INSTRUCTIONS TO OWNER'S REPRESENTATIVES

- A. The mechanical contractor shall provide, without expense to the Owner, competent instructors to train the Owner's representatives in the care, adjustment, maintenance, and operation of all parts on the heating, air conditioning, ventilating, plumbing, and automatic temperature control systems and equipment. Training shall be a minimum of 36 hours with no less than 12 hours for ATC training.
- B. An additional 32 hours shall be provided by all mechanical subcontractors to walk through the building with OSD representative to verify operation of all Division 21, 22, 23, and 26 items and control sequencing.
- C. Instruction date shall be scheduled with the owner at the time of final inspection. A written report specifying times, dates, and the name of personnel instructed shall be forwarded to the Owner's representative.
- D. No training shall begin until system commissioning is complete and accepted by the owner.
- E. Separate factory training shall be provided for each major piece of equipment.
  - 1. Heating Boilers.
  - 2. Cooling Tower.
  - 3. Custom Air Handlers & Rooftop Units.
  - 4. DX Condensing Units.
  - 5. HVAC Pumps.
  - 6. Variable Frequency Drives.
  - 7. Packaged Rooftop Units.
  - 8. Make-Up Air Units.
  - 9. Domestic Water Heaters.
  - 10. Domestic Water Softener.
- F. Training for each piece of equipment shall be for a minimum of (2) OSD personnel for a minimum of 2 days.
  - 1. Training shall be provided at the related equipment factory.
  - 2. Airfare, lodging & meals shall be at the expense of the equipment manufacturer.

### 3.4 PROTECTION AGAINST THE ELEMENTS

- A. The contractor shall, at all times, take reasonable and adequate precautions to protect his work and all stored materials and equipment from damage by the elements, including flooding, windstorms, etc., and shall not expose the work of any other contractor to such damage.
- B. In addition to requirements specified in Division 01, stored material shall be readily accessible for inspection by the Owner's representative until installed.
- C. All items subject to moisture damage, such as controls, shall be stored in dry, heated spaces.
- D. Protect all bearings during installation, and thoroughly grease steel shafts to prevent corrosion.

### 3.5 REMOVAL OF DEBRIS, ETC.

- A. Upon completion of this division of the work, remove all surplus material and rubbish resulting from the work, and leave the premises in a clean and orderly condition.

### 3.6 MOTORS & STARTERS

- A. This contractor shall furnish all motors required and necessary to operate equipment furnished by him. The voltage, phase, and horsepower of each motor shall be coordinated with the electrical contractor prior to ordering.

### 3.7 OPENINGS FOR MECHANICAL SYSTEMS

- A. All openings required for installation of mechanical systems shall be provided by the mechanical contractor. Any piece of equipment which is to be installed in any space of the building and which is too large to permit access through stairways, doorways or shafts shall be brought to the job by the Contractor involved and placed in the space before the enclosing structure is completed. Materials shall be delivered at such stages of the work as will expedite the work as a whole.

### 3.8 SAFETY REGULATION

- A. The contractor shall comply with all local and OSHA safety requirements in performance with this work. (See General Conditions). This contractor shall be required to provide equipment, supervision, construction, procedures, and all other necessary items to assure safety to life and property.

### 3.9 OWNER FURNISHED EQUIPMENT

- A. This contractor shall include in his bid the necessary labor and material to properly coordinate and install the required piping, trim, specialties, controls, ductwork, and other necessary utilities and services to equipment furnished by the Owner.
- B. This contractor shall relocate (where noted), rough-in and make final connections to owner furnished equipment.
- C. See bid documents for a list of owner furnished equipment which is not otherwise identified on the mechanical drawings or in the mechanical division of the specifications.

3.10 RELEASE OF FILES

- A. Release of AutoCad, Revit or Word files will not be provided by Olsen & Peterson Consulting Engineers, Inc.
- B. Olsen & Peterson Engineers, Inc. retains the sole right to all files and intellectual property.

End of Section

## SECTION 23 0501

### TESTING

#### PART 1 – GENERAL

##### 1.1 DESCRIPTION

- A. The work outlined in this section shall be performed by the several trades involved.
- B. The mechanical contractor shall provide all supervision, labor, materials, tools, scaffolding, and equipment required to complete all system testing.
- C. The mechanical contractor shall remove and repair any defective component as indicated by the system tests and retest.
- D. The mechanical contractor shall test the operation of all safety and high limit controls to insure proper installation and operation. Any defective devices shall be replaced.

##### 1.2 TESTS AND ADJUSTMENTS

- A. Before any piping is covered, tests shall be made in the presence of the Owner's Representative, and any leaks or defective work corrected. No caulking of threaded work will be permitted.
- B. Before application of insulation covering, and as far as practical before concealing any piping, all piping shall be hydrostatically tested and proved tight.
- C. Stubs shall be capped and all control valves shall be removed during the test.
- D. System may be tested in sections, providing connections to last section tested are included in each succeeding test.
- E. All medium pressure duct systems shall be tested per SMACNA standards under this section. Coordinate with section 233000.
- F. Following minimum pressures shall be used for testing:
  - 1. Natural gas and compressed air piping at 150 psig for six hours.
  - 2. Domestic hot and cold-water piping at 150 psig for six hours.
  - 3. Plumbing waste and vent piping at 10 ft. head for six hours.
  - 4. Rainwater piping at 10 ft. head for six hours.
  - 5. Medium pressure air ducts in accordance with SMACNA standards.
  - 6. Heating hot water system piping at 150 psig for six hours.
  - 7. Condenser water piping at 150 PSIG for six hours.
  - 8. Refrigerant piping as required in 230900.
  - 9. Grease ducts shall be tested with light and capture/contaminate. Testing in accordance to chapter 5 of the 2021 IMC.

- 1.3 All valves and equipment which may be damaged shall not be subjected to test pressure.



## PART 2 – PRODUCTS

### 2.1 EQUIPMENT

- A. The contractor shall furnish all necessary gauges, plugs, test fans, pumps, etc., as required to conduct the tests.

### 2.2 REPORTS

- A. The contractor shall give the Owner's Representative one week's notice prior to performing the tests. All tests shall be recorded, and copies of reports bound in the O & M manuals and given to the Owner.

## PART 3 – EXECUTION

### 3.1 PROCEDURE

- A. The contractor shall be responsible to conduct all tests in a safe manner, protecting the work of other trades from water or physical damage.
- B. The tests, as indicated, shall be in addition to any test, as required, by any governing agency. Submit all approved tests, as required, by any governing agency to the Owner's representative.
- C. Each test and any necessary repairs and retest shall be performed by the contractor which installed the system.
- D. Upon completion, a test shall demonstrate that the culinary hot water system is circulating, that all traps are properly vented, that there is an ample supply of hot and cold water to fixtures, that no fixture or equipment can be back siphoned, and that there are no back-flow connections.

End of Section

## SECTION 23 0593

### BALANCING

#### PART 1 – GENERAL

##### 1.1 SCOPE OF WORK

- A. The mechanical contractor shall employ an independent technical firm to perform the checking, adjusting, and balancing (CAB) of the HVAC systems. This firm shall be one whose operations are limited to the field of professional CAB, and this firm shall meet the following qualifications:
1. The firm shall be a member of AABC and/or NEBB.
  2. The firm shall be one which is organized to provide professional services of this specific type.
  3. The firm shall have completed projects of similar scope within the past 12 months and shall be capable of performing the services specified at the location of the facility described within the time frame specified, and following up the basic work as may be required.
  4. All personnel used on the job site shall be engineering technicians, who shall have been permanent, full-time employees of the firm for a minimum of six (6) months prior to the start of the work for this project.
  5. **Approved contractors shall be Certified Test & Balance, Independent Test & Balance, BTC Services and Bonneville Test & Balance.**
  6. Additional TAB contractors requesting approval will be reviewed during the addendum process.
- B. As a part of this contract, the mechanical contractor shall make all changes in the sheaves, belts, and dampers, including the addition of dampers required for correct balance as required by the CAB firm, at no additional cost to the Owner.
- C. The mechanical contractor shall provide and coordinate services of qualified, responsible subcontractors, suppliers, and personnel as required to correct, repair, or replace any and all deficient items or conditions found during the testing, adjusting, and balancing period.
- D. In order that all systems may be properly checked, balanced, and adjusted as required by these specifications, the mechanical contractor shall operate said systems at his expense for the length of the time necessary to properly verify their completion and readiness for the CAB and shall further pay all costs of operation during the CAB period.
- E. The project completion schedule shall be coordinated with the CAB work to provide sufficient times to permit the completion of CAB services prior to Owner occupancy.
- F. **A final and complete report with any and all required items completed shall be provided and approved by the project engineer prior to building substantial completion date.**

##### 1.2 DOCUMENTS

- A. The Owner's representative will furnish, without charge to the CAB firm, one set of mechanical specifications, all pertinent change orders, and the following:
1. One complete set of plans less the structural sheets.
  2. One set of mechanical floor plans of the conditioned spaces.

- B. These sheets should be ozalid type (blue or black on light background) reproductions to facilitate marking.
- C. Approved submittal data on equipment installed to accomplish the test procedures outlined in paragraph "Services of the CAB Firm" of this specification will be provided by the mechanical contractor.
- D. The Owner's representative will transmit one copy of the following "Records for Owner" to the CAB firm for review and comments:
  - 1. Record drawings
  - 2. Approved fixture brochures, wiring diagrams, and control diagrams.
  - 3. Shop drawings
  - 4. Instructions
  - 5. Motor and valve charts
  - 6. Operating and Maintenance Manuals

### 1.3 SERVICES OF MECHANICAL CONTRACTOR

- A. The mechanical contractor shall have all systems complete, calibrated, and in operational readiness prior to notifying the CAB firm that the project is ready for their services. The mechanical contractor shall coordinate system readiness with the system commissioning contractor and shall certify in writing to the Owner's representative that the system is complete and ready to balance.

### 1.4 SERVICES OF THE CAB FIRM

- A. The technical CAB firm shall submit biographical data on the individual proposed to directly supervise the CAB work. It shall also submit their record of specialized experience in the field of air and hydronic system balancing.
- B. Act as liaison between the Owner's representative and contractor and periodically inspect the installation of mechanical piping systems, sheet metal work, temperature controls and other component parts of the heating, air conditioning and ventilating systems as the installation progresses. The inspection will cover only those parts of the systems relating to the checking and balancing.
- C. To check, adjust, and balance system components to obtain optimum conditions in each conditioned space in the building.
- D. Prepare and submit to the Owner's representative, complete reports on the balance and operations of the systems.
- E. The CAB firm shall be responsible for inspecting, adjusting, balancing, and logging the data on the performance of the following general systems, including all components.
  - 1. Heating water systems, including pumps, air handlers, rooftop units, coils, controls, etc.
  - 2. Freon compressor systems, including chillers, condensing units, DX coils, controls, etc.
  - 3. Temperature control system in its entirety, includes the verification of all control sequences and safety devices.
  - 4. Domestic hot water recirculating systems.
- F. Before any adjustments are made, the air systems are to be checked for such items as dirty filter, duct leakage, damper leakage, equipment vibrations, correct damper operations, etc.

- G. Before any adjustments are made to water systems, the strainers shall be cleaned, temperature control valve operation shall be checked, pump rotation shall be checked, pressure reducing valves shall be adjusted, etc.
- H. It shall be the responsibility of the CAB personnel to check, adjust, and balance the components of the various systems as listed above using an applicable "proportionate balance procedure" in order that each of them will operate under optimum noise, temperature and air flow conditions in the conditioned spaces in the building "while simultaneously operating at the most energy efficient condition."
- I. During the balancing process, if abnormalities or malfunctions of equipment or components are discovered by the CAB personnel, the owner's representative shall be advised promptly so that the condition may be corrected by the project contractor. Data from malfunctioning equipment or components shall not be recorded in the final CAB report.

## PART 2 – PRODUCTS

### 2.1 EQUIPMENT AND INSTRUMENTS

- A. This contractor shall provide all necessary labor, equipment, scaffolding, instruments, and materials required to adjust, balance, and check all systems.

## PART 3 – EXECUTION

### 3.1 REPORT

- A. The activities, as described hereinbefore, will culminate in a report to be provided to the Owner's representative. This report shall be furnished in six (6) copies. One copy shall be bound in each O & M manual. The intent of the final report is to provide a reference of actual operating conditions for the building operating personnel.
- B. The CAB report shall include the following as a minimum:
  - 1. Preface:
    - a. A general discussion of the systems, any idiosyncrasies, any problems encountered, an outline of normal sequence of operation for the HVAC system cycles, any un-corrected noise problem.
  - 2. Pitot Tube Traverses:
    - a. For use in future trouble-shooting by maintenance personnel, all exhaust ducts, main supply ducts and return ducts will have air velocity and volume measured and recorded by the traverse method. Locations of these traverse test stations will be described on the sheet containing the data.
  - 3. Temperature Tabulation:
    - a. Of all conditioned spaces on a room-by-room basis, a total of at least three readings will be taken of each room on successive days. Record outside ambient temperature at two-hour intervals. The total variation in conditioned space temperatures shall not exceed 2 deg. variance from the thermostat settings.

4. Air Volumes and Velocities:

- a. As measured at each supply grille, return air grille, and exhaust air grille or air handling device. In all fan systems, the air quantities indicated on the plans may be varied as required to secure a maximum temperature variation of two degrees within each separately controlled space, but the total air quantity indicated for each zone must be obtained. It shall be the obligation of the contractor to furnish or revise fan drive and/or motors, if necessary, without cost to the Owner, to attain the specified air volumes.

5. Air Pressure:

- a. As measured across each supply fan, cooling coil, heating coil, air handling unit filter and exhaust fan. Relate these readings to the particular fan curve in terms of CFM handled at the various static pressures, and their relationship to fan power and fan instability.

6. Water Temperature:

- a. Shall be taken entering and leaving the coils and heat exchangers under maximum load conditions in each case.

7. Water Pressure:

- a. At all gauge connections, pressure readings at coils and pumps shall be related to coil and pump curves in terms of gpm handled and confirmed by gpm flow thru Venturi units at each air handler. The flow of water thru all water coils shall be adjusted by manipulating valves until the rated pressure drop across each coil is obtained and total water flow is verified by Venturi readings. On those with 3-way valves, rated pressure drop shall first be adjusted thru the coils in each of the several systems and the temperature differential between inlet and outlet shall be determined to be in each of the several systems and the temperature differential between inlet and outlet shall be determined to be in accordance with its rating. The bypass valves shall then be adjusted on each coil until an equal pressure drop between supply and return connections is obtained with the three-way valves set to bypass all coils in each of the several systems.

8. Electrical Current/Voltage:

- a. Measurements to be taken at the drive motor on each piece of equipment.

9. Fan Speeds:

- a. To be measured in RPM.

10. Instrumentation List:

- a. A list of instruments by type and make used in gathering the CAB data.

11. Drawings:

- a. The CAB contractor's working drawings shall have the VAV, and supply air openings numbered and/or lettered to correspond to the numbers and letters used on the report data sheets so that data in the report can be correlated with each specific supply air opening in the building. If room numbers actually used in the building differ from those on the plans, the building room numbers shall be marked on these plans. Only one such marked-up set of drawings need be provided with the six copies of the CAB report.
- C. Before final acceptance of the CAB report, the report data, at the discretion of the Owner's representative, shall be verified one time on the job site, by selection of check points (not to exceed 10 percent of total) at random, in the presence of the Owner's representative. Representatives of the testing firm doing the work shall be present and provide the necessary equipment for test data verification.
- D. The firm shall be responsible for inspecting, adjusting, balancing, and logging the data on the performance of fans, all dampers in the duct system, all air distribution devices, the flows of freon or water thru all coils, and the power consumption of all motors.
- E. During the CAB work, the temperature regulation will be adjusted for proper relationship between controlling instruments. The Owner's representative will be advised of any instruments out of calibration so that the controls subcontractor may come in and recalibrate, using data supplied by the balancing firm.
- F. Make a total of three inspections within ninety (90) days after occupancy of the building to ensure that satisfactory conditions are being maintained throughout and to satisfy and unusual conditions.
- G. An additional inspection in the building shall be made by the firm during the season opposite that in which the initial adjustments were made. At that time, any necessary modifications to the initial adjustment required to produce optimum operation of the system components shall be made to produce the proper seasonal conditions in each conditioned space.
- H. At the time of opposite season checkout, the Owner's representative shall be given timely notification before any readings or adjustments are made so that they may participate in the checkout.

End of Section

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**SECTION 23 0800**  
**SYSTEM COMMISSIONING**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work required under this section shall include, but not necessarily be limited to, the following:
- B. Commissioning required under this section shall be performed by the Division 22, 23 & 25 Contractor prior to the owners Independent Commissioners review.
- C. A complete Independent System Commissioning shall be performed by the Owners Independent Commissioning Agent.
- D. This requirement **DOES NOT** relieve the contractor of verify installation, start-up, operation & sequencing of all systems prior to owner's Independent Commissioner review and confirmation.
- E. Mechanical contractor shall provide a minimum of 40 hours to aid the owners independent commissioning agent as required. See 230000 (Scope of Work)
- F. Hours to aid the independent commissioning agent shall be provided as indicated in 230893, 230000 & 251000.
- G. The pre-start-up inspection of all systems shall be performed by the Installing Contractor and the owners Independent Commissioning Agent to ensure correct installation and control of all systems.
- H. Repair, replacement, or adjustment of each item noted shall be performed by the installing contractor.
- I. System operations inspection.
- J. The contractor shall be required to provide a detailed commissioning report verifying proper operation of all equipment and devices, correct control sequences for all systems and proper air and water flow for systems throughout the building.
- K. The owner's independent system commissioning agent shall act as liaison between the Owner's representative and contractor and periodically inspect the installation of mechanical piping systems, sheet metal work, temperature controls and other component parts of the heating, air conditioning and ventilating systems as the installation progresses. The inspection will cover only those parts of the systems relating to system commissioning.
- L. Verification of final independent commissioning shall be demonstrated to District representatives as a part of the additional 40 hours of commissioning listed in 230100-11.
- H. An additional 8 hours shall be provided as required for independent commissioning to be used as required by the owner at the time of the 12-month warranty inspection.



- I. The intent of this section is to provide for proper installation, startup, service, and operation of the mechanical systems in preparation for system balancing. See Section 230593 for balancing.

## 1.2 PRE-STARTUP INSPECTION

- A. The pre-startup inspection of all systems shall provide for verifying that each piece of equipment is properly installed and prepared for startup.
- B. All pertinent items shall be checked, including, but not necessarily limited to, the following:
  - 1. Removal of shipping stops.
  - 2. Vibration isolators and seismic snubbers properly aligned and adjusted.
  - 3. Flexible connections are properly aligned.
  - 4. Belts are properly adjusted.
  - 5. Belt guards and safety shields are in place.
  - 6. Safety controls, safety valves, and high or low limits are properly installed and functioning.
  - 7. All systems are properly filled.
  - 8. Filters are in place with a proper seal around their edges.
  - 9. Fire dampers are properly installed, linked, and serviceable.
  - 10. Pressure and temperature gauges of the proper size and range are installed.
  - 11. All test stations and measuring devices are properly installed and functioning.
  - 12. Initial lubrication of equipment is complete.
  - 13. Filters and strainers are clean.
  - 14. Motor rotations are correct.
  - 15. Voltages match nameplates.
  - 16. Control system is operating properly.
  - 17. All interlocks are wired and verified.
  - 18. All controls have been connected and verified.
  - 19. All valves, dampers, and operators are properly installed and operating.
  - 20. All ductwork is installed and connected.
  - 21. All roof-mounted equipment is properly flashed.
  - 22. All water piping is either heat taped, or located in spaces which are heated to prevent freezing.
  - 23. Piping which is run above the roof or is otherwise subjected to freezing is properly heat taped and insulated.
  - 24. All other items necessary to provide for proper start-up.
  - 25. All seismic restraints are in place and secured.
  - 26. All condensate drain lines are piped to discharge in proper drains.

## 1.3 FIRST RUN INSPECTION

- A. Recheck all items outlined in pre-startup inspection to insure proper operation.

B. Check the following items:

1. Excessive vibration or noise.
2. Loose components.
3. Initial control settings.
4. Motor amperages.
5. Heat buildup in motors, bearings, etc.
6. Control system is sequencing properly, calibrated and functioning as required.
7. Heat tapes are wired & functioning.

C. Correct all items which are not operating properly.

1.4 SYSTEM OPERATION INSPECTION

A. The mechanical systems shall be observed by the owner under operation conditions for sufficient time to insure proper operation under varying conditions, such as daylight and heating-cooling.

B. Periodically check the following items:

1. Strainers and filters.
2. Visual check of air flow for "best guess" setting for preparation for system air balancing under Section 230593.
3. Control operation of time clocks, on-off sequences, system cycling, etc.
4. Visual checks for water flow, seals, packings, safety valves, operating pressures and temperatures.
5. Cleaning of excessive oil or grease.
6. Dampers close tightly.
7. Valves close tightly.
8. System leaks.
9. All other items pertaining to the proper operation of the mechanical system, whether specifically listed or not.

1.5 WARRANTY SCHEDULE

A. Provide a list in each O & M Manual of all motors, fans, and equipment with manufacturer's names, models, serial numbers and date of startup approved by the Owner's representative, date of warranty, extent of warranty, and equipment supplier with address and phone numbers.

1.6 SCHEDULE OF OVERLOAD PROTECTION

A. Provide a list in each O & M Manual of all motors with size, voltage, amperage, and size and rating of overload protection.

1.7 REPORT

A. Prior to the start of system balancing the Division 22, 23 & 25 sub-contractors shall be required to submit a detailed written report to the owner's representative outlining the results of the system commissioning work for each system and piece of equipment which lists any un-corrected system abnormalities.

## 1.9 CERTIFICATION

- A. Provide written certification of all tests, and start-up procedures. Bind a copy of this certification in the O & M manuals. Certification shall include an itemized list of systems serviced during the system commissioning process with dates, times, and a complete description of the work completed, and the name of the responsible system commissioning mechanic.

## 1.10 BUILDING OPERATION DEMONSTRATION

- A. Contractor shall include as a part of their bid an additional 40 hours for all Division 22 & 23 sub-contractors to demonstrate to building owner, and/or owner's representative that proper installation, operation, air and water balance, control, and system commissioning has been completed properly for all equipment, material or systems provided and/or installed by Division 22 & 23 contractor.
- B. Systems shall be commissioned in their entirety and all items resolved prior to this demonstration. This demonstration does not replace the owner training requirements.

End of Section

## SECTION 23 0900

### BASIC MATERIALS AND METHODS

#### PART 1 – GENERAL

##### 1.1 DESCRIPTION

- A. This section specifies the basic materials and methods to be used in Division 22, 23 and 25 work.

##### 1.2 MATERIALS & EQUIPMENT

- A. All materials shall be new and undamaged. Protect all stored materials and equipment from damage by the elements, including exposure to excessive heat, flooding and rain, windstorms, etc.
- B. All materials and equipment shall be installed in strict compliance with the manufacturer's recommendations.

##### 1.3 CUTTING AND PATCHING

- A. Any cutting, patching, or filling necessary for the proper execution of this work, except as noted in the drawings, shall be done by this contractor.
- B. No rough or unsightly work will be allowed. Cutting of structural members shall be done only on approval of the Owner's representative.
- C. The attention of the contractor is directed to the requirements of running pipes thru concrete slabs, walls, and beams. These conditions are to be anticipated and sleeves installed as provided for under "Sleeves".

##### 1.4 INSERTS

- A. Furnish and set, in all necessary locations, before or during construction, unistrut inserts for use in connection with the support and seismic restraint of piping, ductwork, and equipment furnished under this division of the work.

##### 1.5 SLEEVES

- A. Sleeves for Concrete or Masonry Surfaces:
- B. For pipes passing thru masonry or concrete construction, provide sleeves at least two pipe sizes larger than the pipe passing thru and made from sections of steel pipe.
- C. Provide galvanized iron sleeves with collar on each side of wall for all ducts passing thru masonry or concrete construction.
- D. Provide 22-gauge sheet metal collars on each side of wall for all ducts passing thru gypsum wall construction or similar construction.
- E. Sleeves shall be placed in structural members only where approved by the Owner's representative.
- F. Sleeves through foundation walls below grade shall be mechanical seal type with watertight sealing grommets and pressure rings. Sealing grommets shall be non-melting at temperatures incurred. Foundation wall sleeves shall be "O.Z. Type WSK".

G. Sleeves thru Finished Surfaces:

For pipes passing thru finished partitions or ceilings, provide galvanized sheet iron sleeves of suitable size. The sleeves shall be fastened to construction to prevent creep along pipe and the sleeve ends shall be flush with finished surfaces. Provide escutcheon plates at each side of finish wall or floor or ceiling for all pipes passing thru same.

1. Sleeves thru Fire-rated Surfaces:

- a. All pipe sleeves and ductwork penetrating fire walls and surfaces shall be packed inside after pipes and/or ducts have been placed with a U.L. listed fire safing system. The contractor shall submit to the Owner's representative for review and approval specific installation diagrams showing exact method(s) to be used.

2. Sleeves thru Sound Rated Surfaces:

- a. All pipe sleeves and ductwork penetrating sound rated walls or surfaces shall be packed with dense fiberglass, sealed with duct sealer and fitted with metal cover flanges on both sides.

3. Sleeves thru Floors:

- a. Sleeves thru floors above grade shall extend 1" above the floor and shall be sealed watertight with waterproof silicone caulking.

1.6 PIPING & DUCTWORK SUPPORT

- A. Steel roof deck shall not be used to support loads from plumbing, HVAC ducts, light fixtures, architectural elements or equipment of any kind, unless specifically noted otherwise. Lightweight suspended acoustical ceilings with a total weight per wire not exceeding 50# may be hung from the steel roof deck. The hangers should be staggered to distribute the load over multiple deck flutes.
- B. Bracing of miscellaneous items (mechanical, electrical, plumbing, etc.) to the bottom chord of joists or girders will not be allowed in any instance. All lateral braces must connect to the top flange/top chord of the framing member above unless noted otherwise on the structural drawing.
- C. Beam clamps shall not be used to hang piping from open web joist, trusses or girders.
- D. Beam clamps **are not** allowed for support of piping from joists. Uni-strut supports from top chord of joist is a method of attachment. Coordinate with structural details.
- E. All concentrated loads greater than 100 pounds supported by open web steel joists and girders shall be located within 6 inches of joist or girder panel points or the joist or girder shall be reinforced with an additional web member. Refer to the "TYPICAL DETAIL AT ADDITIONAL CONCENTRATED POINT LOAD" in the structural drawings.
- F. Concentrated point loads, single or multiple, totaling 100 pounds or less can be located at any point along the top or bottom chord of an open web steel joist or girder between adjacent panel points without meeting the requirements above. A limit of four concentrated 100# maximum point loads per joist or girder will be permitted on spans of 12' or greater, one concentrated 100# max. load on spans less than 12', unless specifically noted otherwise on the structural drawings.
- G. Joist bridging shall never be used to support hanging loads.

- H. Bracing of miscellaneous items (mechanical, electrical, plumbing, etc.) to the bottom chord of joists or girders will not be allowed in any instance. All lateral braces must connect to the top flange/top chord of the framing member unless noted otherwise on the structural drawings.
- I. For all attachments to open web steel joists, the attachment to the joist shall equally distribute the load to both chord angles in a manner that does not induce torsion (twist) to the chords. Beam clamps may not be used.
- J. Steel roof deck shall not be used to support loads from plumbing, HVAC ducts, light fixtures, architectural elements or equipment of any kind, unless specifically noted otherwise. Lightweight suspended acoustical ceilings with a total weight per wire not exceeding 50# may be hung from the steel roof deck. The hangers should be staggered to distribute the load over multiple deck flutes.

#### 1.7 PIPE LOCATION AND ARRANGEMENT:

- A. No water supply piping inside the building shall be placed in direct contact with the earth. Buried water piping shall be placed in split tile or PVC pipe below the 4" of gravel to keep pipe from direct contact with ground.
- B. Unless otherwise noted on the drawings, all water piping shall be kept out of concrete floor slabs.
- C. Under no circumstances shall plastic piping or ducting materials be run inside of supply or return air plenums.
- D. All piping shall be properly racked and supported to run straight and true.
- E. All changes in direction shall be made with approved fittings. Pipes shall not be bent to change direction.
- F. All piping shall be racked and run to facilitate maintenance work. Under no circumstances shall valves, shock absorbers, drip traps, or piping specialties be installed in a "closed space" without proper access provided for future maintenance. See "Access Doors" section of specifications.
- G. NOTE: All piping shall be capped or plugged at the end of each work shift and when not being extended, to prevent the entry of rocks and debris.
- H. Any timelines are broken or disconnected, they shall be capped immediately after flushing to remove rock and debris from pipes. If rocks or other foreign materials are found in the system after it has been closed, the contractor shall stand the expense of their removal.
- I. All valves, piping, and equipment to be installed so as to permit disassembly for maintenance purposes.
- J. Provide drain valves at all low points in piping systems. Run to floor drain where possible, otherwise provide 3/4" hose connection with vacuum breaker.

#### 1.8 VERIFICATION OF INSTALLATION

- A. At time of final inspection contractor shall provide a color video tape of all new 3" and larger buried storm sewer and sanitary sewer lines both inside and outside the building running to sampling manhole.

- B. Video must be taken after installation is complete to ensure that line is installed properly with no low spots, separations, etc. Video shall also ensure that all connections have been made properly and that no debris remains in piping system. Building owner shall be notified to witness videotaping.
- C. Piping video shall be performed by a source approved by owner and project engineer.

#### 1.9 PIPE JOINING

- A. **All steel pipe under 2" in size shall be joined by screwed connections. Heating hot water, condenser water and chilled water piping shall be welded if pipe size is over 2".**
- B. Welded ends shall be plain beveled. Welding fittings must be employed. Small (1-1/2" and smaller) branch connections may be made with Weldolets or Thredolets provided the main is at least 2" dia., and not less than two pipe sizes larger than the branch. Where these connections are used, the pipe opening in the main shall be cut to insure a full inside pipe diameter at the branch connection. Slag and spelter resulting from the hole cutting shall be removed from the main piping.
- C. All joinings shall be made to maintain the full metal strength of the pipe, with neat and workmanlike appearance.
- D. All piping must be perfectly clean before the system is filled.
- E. Copper Piping in Domestic Water Service: Piping shall be cut (with a pipe cutter) so ends are square and will "bottom" in fittings. There must be no gaps left thru which solder can run into the line. If a hack saw must be used, it shall be guided with a miter box to ensure a square, even cut. Tubing shall be reamed to remove burrs, being careful not to expand tubing while reaming.
- F. The outside of the copper pipe and the inside of the fittings, where solder will be applied, shall be burnished with fine crocus cloth or fittings brushes until all dirt and oxide is removed.
- G. A light coat of soldering flux shall be applied to both pipe and fittings. Acid flux shall not be used.
- H. Joints in copper pipe shall be uniformly heated to proper soldering temperature to ensure that solder will flow to all parts of the joint. The solder shall be fed to the joint until a uniform line of solder appears around the pipe at the end of the fittings.
- I. Copper piping used in domestic water service shall be joined with 'Stay-Safe-50' or 'Silvabrite-100' no lead solder.
- J. When valves are being installed in copper piping, the non-metallic parts shall be removed to prevent the heat of soldering from damaging the valves. No heat shall be applied near where an excessive temperature may cause damage.
- K. Qualification of Welders: Welders performing work under this Contract shall be certified and qualified in accordance with tests prescribed by the National Certified Welding Bureau (NCWB) or by other approved test procedures using methodology and procedures covered in the ASME Boiler and Pressure Vessel Code, Section IX, "Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators."
- L. Submit for approval the names, identification, and welder's assigned number, letter or symbol of welders assigned to this project.
- M. The assigned identification symbol shall be used to identify the work of each welder and shall be indelibly stamped immediately upon completion of each weld.

- N. Welders shall be tested and certified for all positions.
- O. Submit identifying stenciled test coupons made by each operator.
- P. Any or all welders may be required to retake welding certification tests without additional expense. When requested, a welder shall not be permitted to work as a welder on this project until he has been recertified in accordance with NCWB.
- Q. Recertification of the welder shall be made after the welder has taken and passed the required tests.
- R. Where piping 1-1/2 inches and smaller is to be butt or socket welded, submit 3 samples of test welds for approval.
- S. All domestic copper piping 3" and larger shall be brazed.
- T. All HVAC copper piping 3" and larger shall be brazed.

1.10 SCREWED CONNECTIONS

- A. All pipes shall be reamed at the ends and free of all inside scale or burrs. Threads shall be cut clean and sharp, and to a length equal to 1-1/8 the length of the female thread receiving the pipe. The pipe shall be screwed in the full length of the female thread.
- B. Pipe shall be made tight with teflon thread tape or thread lubricant worked into male thread only. Surplus material shall be wiped off and the joint left neat and clean. Lubricant shall be powdered graphite and linseed oil, or plumbage and linseed oil.

1.11 PIPE GRADING

- A. Piping shall be uniformly graded in direction of flow as noted below:

| PIPING               | FALL/RISE | DIRECTION | PER/RUN |
|----------------------|-----------|-----------|---------|
| Rainwater            | 1"        | Down      | 4'      |
| Water                | 1"        | Up        | 40'     |
| Waste - 4" & smaller | 1"        | Down      | 4'      |
| Waste - 6"           | 1"        | Down      | 8'      |
| Vent                 | 1"        | Up        | 4'      |
| Condensate Drip      | 1"        | Down      | 4'      |
| Heating Water/Glycol | 1"        | Up        | 40'     |
| Condenser Water      | 1"        | Up        | 40'     |
| Natural Gas          | 1"        | Down      | 40'     |
| Refrigerant          | 1"        | Down      | 40'     |



## 1.12 THRUST BLOCKS

- A. Plugs, caps, tees, and bends deflecting 22-1/2 degrees or more, either vertically or horizontally, on water lines 6 inches in diameter or larger, shall be provided with thrust blocking, or metal tie rods and clamps or lugs, as directed. Valves shall be securely anchored or shall be provided with thrust blocking to prevent movement. Thrust blocking shall be concrete of a mix not leaner than 1 cement: 2-1/2 sand: 5 gravel and having a compressive strength of not less than 2000 psi after 28 days. Blocking shall be placed between solid ground and the hydrant or fitting to be anchored. Unless otherwise indicated or directed, the base and thrust bearing sides of thrust blocks shall be poured directly against undisturbed earth. The sides of thrust blocks not subject to thrust may be poured against forms. The area of bearing shall be as directed. Blocking shall be placed so that the fitting joints will be accessible for repair. Steel rods and clamps shall be protected by galvanizing or by coating with bituminous paint.

## 1.13 EQUIPMENT BASES

- A. Pumps, tanks and other equipment shown on the plans shall be set on 4" high concrete pads. The pads shall be furnished as indicated on plans. The mechanical contractor shall coordinate pad size and location with the general contractor.
- B. Roof curbs shall provide a free height from the roof membrane to the top of the curb of at least 12" minimum. All roof curbs and platforms shall have a wood nailer strip around the top perimeter for securing the roof membrane and attaching roof flashings. All equipment mounted on roof curbs shall be installed level. Flashings by Division 7.
- C. Roof curbs shall be attached to building structure as required by the IBC and local codes.

## 1.14 VIBRATION ISOLATION

- A. All mechanical equipment over 5 H.P. shall be isolated in accordance with the 2018 ASHRAE Handbook.
- B. Care shall be taken by this contractor to prevent the transmission of vibration from equipment to building structure. Flexible connectors shall be installed in all piping connecting to pumps, air handling units, cooling towers, and other flexibly mounted equipment.
- C. Flexible connection shall be specifically designed to absorb noise and vibration and to prevent damage to equipment caused by piping stress. Unit construction shall consist of heavy bellows type neoprene rubber hose sections with stainless steel liners and attachments to match piping, or three (3) grooved flexible couplings for grooved pipe systems.

## PART 2 – PRODUCTS

### 2.1 PIPING SYSTEMS

- A. All piping shall be in accordance with the American Society for Testing and Materials, ASTM A-53. No foreign made piping or connectors will be accepted in this construction.
- B. Water piping to the pressure reducing station shall be Class 52 ductile iron pipe with mechanical joints.
  - 1. SDR piping from site utilities is an approved alternate to ductile iron pipe in.

- C. Culinary cold, hot, and recirculating hot water above grade shall be Type "L" copper with soldered wrought copper fittings. Pull-T type fittings on copper piping are not allowed.
- D. Culinary cold, hot, and re-circulating hot water exposed in kitchen shall be 316 stainless steel with welded joints. ASTM A312, A778 with ASSR1079 dielectric fittings or unions.
- E. All rainwater buried waste and vent piping below slabs shall be standard weight DWV schedule 40, solid core PVC ASTM F 1488 piping.
- F. Rainwater and waste and vent piping above grade shall be standard weight cast iron pipe with no-hub, tyseal, M-G, or A.B.I. 'Best' gasketed fittings for sizes 2" and larger; and galvanized Schedule 40 with tarred Durham drainage fittings for 1-1/2". All drain waste, vent, sewer, and storm lines shall be of cast iron soil pipe and fittings and shall conform to the requirements of CISPI Standard 301, ASTM A 888 or ASTM A 74. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute and be listed by NSF International.
- G. Joints:
  - 1. No-Hub Couplings: No-hub coupling shall conform to CISPI Standard 310 and shall be listed by NSF International.
  - 2. Compression Gaskets for Hub & Spigot: Compression gaskets shall conform to the requirements of ASTM Standard C 564 and ASTM C 1563.
  - 3. Joints for pipe and fittings shall conform to the manufacturer's installation instructions and local code requirements. All cast iron pipe and fittings, above ground, shall bear the collective trademark of the Cast Iron Soil Pipe Institute, or have prior approval of the engineer.
- H. Heating hot water piping, condenser water piping system piping above grade shall be Schedule 40 black steel pipe. All piping 2" and larger shall be welded.
- I. Indirect cooling water system piping in building shall be Aquatherm "Blue" polypropylene multi-layer piping with heat fused joints and fittings.
  - 1. Piping and fittings shall be insulated per section 220700.
- J. Condensate drip lines shall be Type "M" copper with soldered wrought fittings.
- K. Gas lines shall be Schedule 40 black steel pipe. Fittings shall be standard black malleable screwed, or standard welding fittings where welding is required. All gas lines shall be installed in strict compliance with the local fuel supply company requirements. Buried piping shall be coated or wrapped.
- L. Gas lines below slab shall be corrugated stainless steel tube (CSST). All gas lines shall be installed in strict compliance with the local fuel supply company requirements. Piping below slab to be encased in a Schedule 40 PVC pipe with long sweep elbow. Casing to terminate 1" above slab. PVC casing to be two pipe sizes larger than carrier pipe but be 2" minimum.
- M. Gas lines located outside the building and below finished grade shall be ASTM D2513 polyethylene plastic pipe. Fittings shall be ASTM D2513 polyethylene, butt-fusion type; and ASTM D2683, polyethylene socket-fusion type. Installation and piping material shall be in strict compliance with the local fuel supply company requirements.

- N. Culinary water and heating hot water below slab shall be Type K soft copper. No fitting allowed below the slab. Piping below slab to be encased in a Schedule 40 PVC pipe with long sweep elbows. Casing to terminate 1" above slab. PVC casing to be two pipe sizes larger than carrier pipe but be 2" minimum.
- O. Refrigeration piping shall be Type "L" copper with malleable copper fittings. Piping shall be specifically treated and sealed for refrigeration systems piping, similar to Mueller.
- P. NOTE: Pre-charged line sets will be permitted on refrigeration systems with rated capacities below 65,000 BTUH.
- Q. NOTE: All exposed piping, fittings, valves, and trim in kitchen area shall be chrome plated.
- R. Boiler & water heater condensate drain lines shall be high temperature schedule 40 CPVC pipe and fittings.
- S. Kitchen areas - all exposed drain piping shall be DWV copper.

## 2.2 HANGERS AND SUPPORTS

### A. Vertical Piping:

- 1. Attachment - Vertical piping shall be secured at sufficiently close intervals to keep the pipe in alignment and to carry the weight of the pipe and contents. Stacks shall be supported at their bases, and if over two (2) stories in height at each floor by approved metal floor clamps.

B. Cast iron soil pipe shall be supported at not less than each story height and at its base.

C. Screwed pipe (IPS) shall be supported at not less than every other story height.

D. Copper tubing shall be supported at each story for piping one and one-half (1-1/2) inches in diameter and at not more than six (6) foot intervals for piping one and one-quarter (1-1/4) inches in diameter and smaller. Piping shall be wrapped with three wraps of vinyl tape to isolate pipe from ferrous pipe supports.

E. Horizontal Piping: Under no circumstances shall piping be supported from the metal roof deck.

F. Any attachments allowed to acoustical decking shall be attached per deck manufactures requirements, and as directed by structural engineer.

G. It is essential that all piping be supported from top chord of roof structure at joist panel point locations. Coordinate with structural requirements.

H. Supports - Horizontal piping shall be supported at sufficiently close intervals to keep it in alignment and prevent sagging.

I. Cast Iron Soil Pipe - Where joints occur, soil pipe shall be supported at not more than 5-foot intervals, except that where 10-foot pipe lengths are used, supports at 10-foot intervals are acceptable. Supports shall be placed within eighteen (18) inches of the hub or joint. No-hub joints and fittings shall be restrained with rods and clamps per manufacturer's recommendations.

J. Screwed pipe (IPS) shall be supported at approximately 12-foot intervals.

- K. Copper tubing shall be supported at approximately 6-foot intervals for piping one and one-half inches and smaller in diameter and at 10-foot intervals for piping two inches and larger in diameter.
- L. Piping placed underground shall be laid on a firm bed for its entire length.
- M. Hangers shall be Grinnell Figure 260 for both bare and insulated pipe.
- N. Where roller type supports are used, they shall be chair type or suspension type, as required. (Provide carbon steel pipe saddles on insulated pipes).
- O. Where piping is run adjacent to walls or steel columns, it shall be supported from steel brackets or vertical channel hangers. Brackets shall be Grinnell Figure PS 732 or PS 3282 as directed, or approved substitute. Channel systems shall be approved for each condition on an individual basis.
- P. Furnish all hangers, inserts, brackets, anchors, guides, sliding supports, etc., and all auxiliary steel necessary for the installation. All supports shall be designed in accordance with the AISC Steel Handbook and painted with one shop coat of primer paint.
- Q. Insulation inserts and shields for cold surface piping will be provided under Section 15180 of these specifications.
- R. Pipe covering protection saddles shall be installed at all pipe hangers which support insulated "hot surface" piping. Saddles shall be tack welded to the piping and shall match the insulation thickness applied.
- S. All copper, fiberglass, or plastic piping shall be securely supported from the building structure at intervals specified and/or as recommended by the pipe manufacturer. Hanger shields for suspended piping shall be functionally similar to isolators with Grinnell Fib. 97. Non-ferrous piping shall be isolated from contact with ferrous supports with three wraps of vinyl tape.
- T. All piping in mechanical equipment rooms shall be supported with vibration control hangers.
- U. Plumbers' tape, chain, or wire will not be permitted for pipe support.
- V. **Beam clamps for piping at roof joists will not be allowed.**
- W. Beam clamps shall not be used to hang piping from open web joist, trusses or girders.

## 2.3 VALVES AND STRAINERS

- A. All valves and strainers shall be by one manufacturer. Approved valve manufacturers are Crane, Stockham, W. C. Norris, Grinnell, or Powell. Crane numbers are used for convenience.
- B. Heating, Cooling, and Domestic Hot and Cold Water:
- C. Gate Valves:
  - 1. Valves 2" and smaller shall be Crane No. 428, bronze, screwed, 200# WOG gate valve with solid wedge disc and rising stem.
- D. NOTE: If unable to use a rising stem valve because of insufficient clearance, use a Crane No. 438 non-rising stem valve.

E. Globe Valves:

1. Valves 1-1/2" and smaller shall be Crane No. 37, bronze, screwed, 200# WOG globe valve with a replaceable teflon disc and teflon packing. The disc shall be suitable for hot water up to 360 deg. F. at 150 psi.

F. Check Valves:

1. Valves 1-1/2" and smaller shall be Crane No. 37, bronze, screwed, Y-pattern 200# WOG swing check valve. Valves 2" and larger shall be Crane No. 373.

G. Butterfly Valves:

1. Valves 2-1/2" and larger shall be Crane No. 23N-BRB iron body and disc, lug type, stainless steel stem, 200# WOG EPT Nordel seat rated for 275 deg. F butterfly valve.

H. NOTE: Valves 6" and smaller shall be equipped with the proper size 10 position Multi-lock hand lever. Valves 8" and larger shall be equipped with the proper size Extra Power Manual weatherproof gear operator.

I. Ball Valves:

1. For hot and cold domestic water service: Valves 2" and smaller shall be Crane No. 2190H bronze, screwed, 200# WOG, Gem ball valve with Buna-N rubber capsule. Watts B6000 or Apollo 70-100.

J. For heating service as isolation or balancing valves: Valves 2" and smaller shall be Crane No. 219H, bronze, screwed, 200# WOG, Hydro Gem ball valve with EPT Nordel capsule. (If solder-joint ball valves are desired, use Crane No. 2192H). NOTE: Valves must be suitable for temperature and pressure required in the individual application.

K. Strainers:

1. Strainers 1-1/2" and smaller shall be Crane No. 988-1/2, iron body, screwed Y-pattern, 200# WOG, sediment separators with a 20-mesh Monel screen.

L. All strainers shall be installed with fine mesh supplementary "construction screens" which shall remain in place while the system is flushed and chemically cleaned. The "construction strainer" basket shall be removed just prior to balancing the water systems.

M. Provide blow-down ball valve on all strainers same size as strainer tapping.

N. Gas Service:

1. Ball Valves:

- a. Valves 2" and smaller shall be Crane No. 2330-TF, bronze, screwed, 400# WOG Accesso ball valve with teflon seats, and shall have Underwriters' approval for LP gases up to the pressure limit of 250 psi set by that agency.

2. Gate Valves:

- a. Valves 3" and smaller shall be Crane No. 424, bronze, screwed, 400# WOG gate valve with Exelloy seats and shall have Underwriters' approval for LP gases up to the pressure limit of 250 psi set by that agency.

3. Globe Valves:

- a. Valves 2" and smaller shall be Crane No. 130, bronze, screwed, 400# WOG globe valve with a No. 6 replaceable composition disc and shall have Underwriters' approval for LP gases up to the pressure limit of 250 psi set by that agency.

4. Check Valves:

- a. Valves 2" and smaller shall be Crane No. 132, bronze, screwed, 400# WOG horizontal lift check valve with a No. 6 replaceable composition disc and shall have Underwriters' approval for LP gases up to 250 psi set by that agency.

5. Pressure Regulators:

- a. Furnish and install approval type gas pressure regulators in gas piping ahead of each appliance and piece of equipment, to which is connected. Regulators located outside the building shall have weatherproof vent with bugproof screen. Regulators located inside of building shall be vented to the outside with weatherproof vent and bugproof screen.

2.4 NON-SLAMMING OR SPRING-LOADED CHECK VALVES

- A. Types: Provide valves of the fully guided or cone-and-diaphragm types.
- B. Bodies: Provide flanged or wafer type bodies constructed of cast iron ASTM A 126, Class B; cast steel ASTM A 216/A 216M, Class WCB; stainless steel, Type 304 or cast bronze ASTM B 61.
- C. Trim: Seats, discs and springs shall be constructed of 18-8 stainless steel or bronze complying with ASTM B 62. Seats may be of elastomers suitable for 250 degrees F. minimum continuous working temperature or not less than 50 degrees F. above the operating temperature of the system, whichever is higher.
- D. Mating Surfaces: Mating surfaces of closure faces shall be bronze or Type 316 or 17-4PH stainless steel or elastomer approved for the particular service and materials must be compatible to prevent electrolytic action.
- E. Pressure Loss: Pressure loss through the valves, measured in feet of water, shall not exceed 6/10 of the water velocity in feet per second.
- F. Bubble-Tight: Non-slamming and spring-loaded check valves shall provide bubble-tight shut-off when handling water up to 250 degrees F. and 125 pounds per square inch differential pressure. Design shall prevent rubbing of seat materials when opening and closing. Poppet valves shall have conical springs.

## 2.5 GENERAL DUTY VALVES & SPECIALTY COCKS

### A. Cocks:

1. Balancing cocks 1-1/2" and smaller shall be Crane No. 80E, bronze, screwed, 200# WOG.
2. Balancing cocks 2" and larger shall be Crane No. 325, all iron, flanged 125# WOG.
3. Gas cocks 2" and smaller shall be Crane No. 270, flat head, bronze screwed.
4. Gage cocks shall be Crane No. 744, 1/4", bronze, screwed.
5. Petcocks shall be Crane No. 702, 1/4", bronze, screwed with lever handle.
6. Trycocks shall be Crane No. 734, 3/8", bronze, screwed, 250# rated with stuffing box.
7. Provide two complete sets of wrenches for all cocks and stops.

## 2.6 BACKFLOW PREVENTERS

- A. Backflow preventers shall comply with the requirements of the State Plumbing Code and the 2021 IPC as to type, style, size, location, and arrangement for the actual installed duty.
- B. Where backflow preventers are installed which release water thru the valve to the atmosphere, these units shall be provided with drip pans which collect the free water. The drip pans shall be piped to the nearest drain.
- C. All backflow preventers shall be installed with all necessary isolation valves and test cocks.

## 2.7 AUTOMATIC VALVES AND WELLS

- A. The mechanical subcontractor shall install the automatic temperature control valves, temperature sensing wells, and flow switches, as directed by the automatic temperature control subcontractor.

## 2.8 UNIONS

- A. Ground joint unions shall be installed on pipe 2-1/2" and under where indicated on drawings. Whenever piping is connected to a major piece of apparatus, unions shall be provided as near as practical on each side of the apparatus.

## 2.9 ISOLATION FITTINGS

- A. Approved isolation fittings shall be installed at the junction of all copper and steel piping to prevent electrolytic action. **Fittings shall be NZR brass unions or fittings.**

## 2.10 THERMOMETERS

- A. General: Provide liquid-in-glass type thermometers or Vari-angle digital thermometers as manufactured by Weiss unless bimetal dial type is required due to space limitations or other conditions.
- B. Scale and Dial: Provide liquid-in-glass thermometers of the organic liquid type having a nominal scale length of not less than 7 inches. Provide bimetal dial thermometers with a nominal 5-inch dial size graduated through a minimum arc of 270 degrees. Provide a recessed dial so that graduated portion and pointer are in the same plane.
- C. Range: Temperature range shall be as shown on the drawings or as specified. Chilled water system 20 degrees F. to 120 degrees F. Hot water system 30 degrees F. to 240 degrees F. Condenser water system 30 degrees F. to 240 degrees F.

- D. Case: Provide liquid-in-glass type thermometer with an aluminum alloy or steel case. Provide bimetal dial thermometers with all exposed metal parts, including the case and stem made of 300 Series stainless steel, all welded construction.
- E. Accuracy and Calibration: Bimetal dial thermometers shall have zero adjustment for recalibration and shall have an accuracy of plus or minus one percent of span through the complete range. Liquid-in-glass thermometers used for indicating shall have an accuracy of plus or minus 0.5 degree Unless otherwise required in other sections of the specifications, thermometers for commissioning tests shall have an accuracy of plus or minus 0.25-degree F.
- F. Thermometers measuring temperature for energy calculations shall have an accuracy of plus or minus 0.1-degree F.
- G. Thermometer Wells: Provide pipeline liquid-in-glass thermometers with a union connection, tapered bulb chamber and matching taper on well. Provide bimetal dial thermometers with a well to match bulb chamber. Provide wells for insulated pipe of the extension neck type suitable for insulation thickness. Provide wells fabricated of bronze, brass or 316 stainless steel suitable for the fluid or gas in the pipe.
- H. Stem: Provide stems with a minimum length of 2-1/2 inches immersion which shall be increased in length as necessary to reach the center lines of the pipes in which they are installed.
- I. Adjustment: Provide straight or angle pattern adjustable type thermometers as required to facilitate readings.
- J. Thermometers shall be Palmer, Trerice, Marsh or Weiss. Install all thermometers so as to be easily readable from the floor.

## 2.11 PRESSURE GAUGES

- A. General: Provide pressure gauges which comply with ANSI B40.1.
- B. Dials: Provide dials not less than 4-1/2 inches in diameter, except that packaged equipment may be provided with manufacturer's standard gauges of equal accuracy.
- C. Ranges: Select operating ranges so that during normal service the gauge pointer will be at the approximate midpoint of the gauge scale.
- D. Refrigerant Gauges: Provide refrigerant pressure gauges with corresponding temperature scales for the particular refrigerant sensed.
- E. Accuracy: Pressure gauges used for commissioning of other equipment shall have a minimum accuracy of 3 percent of span.
- F. Gage Cocks: All gages shall be furnished with gage cocks and pressure snubbers.
- G. Gauges shall be Ashcroft, Trerice, or U.S. Gage.

## 2.12 PRESSURE & TEMPERATURE TEST PLUGS

- A. Plugs shall be brass body type with Neoprene, Nordel or Vitron self-closing valve (to suit temperatures of fluid in pipe). Test plugs shall be Pete's Plug or approved substitute. Furnish six pressure and six temperature instruments to Owner to permit reading pressures and temperatures.



## 2.13 FLOW MEASURING AND BALANCING SYSTEMS

- A. Furnish and install complete the Venturi and calibrated orifice Flow Metering Systems as shown on the drawings.
- B. This shall be a coordinated system with individual Venturi Flow Stations supplied by one manufacturer and each individual calibrated orifice supplied by one manufacturer.
- C. On pipe sizes 3/4-inch diameter and smaller, provide calibrated balancing valves on runouts to fan coil units, fin tube radiation, convectors and reheat coils.
- D. Fittings shall be of the combination balancing and shut-off type with the balancing device positioned by an Allen set screw or other approved method which permits closing of the valves without disturbing its balanced position.
- E. Bodies may be of the globe or "Y" type with contour flow plug or approved equivalent.
- F. Provide a graduated dial or other device to indicate the valve setting.
- G. Gland shall permit packing under pressure.
- H. Materials and construction shall be as specified for water valves sizes 1-1/2-inch and smaller.
- I. On sizes 3/4-inch and smaller ends may be sweat or compression type.
- J. Each station shall be complete with quick disconnect valves and safety shut-off valves, metal identification tag on chain giving pipe size, meter series, station identification, and meter reading at specified flow rate. Metering stations shall be selected so that design flow rate shall be between 10 and 40 inches of water pressure differential with permanent pressure loss of not more than 25% of indicated flow rate differential pressure.
- K. The calibrated flow metering valves shall be selected to deliver the rated flows at the mid-point of their set-point range.
- L. A master meter shall be furnished to the owner for maintenance purposes.
- M. Venturi Flow Metering System shall be by Barco Engineering Company or Robertson. Calibrated orifice system shall be Bell & Gossett, Armstrong, or Taco.

## 2.14 V-BELT DRIVES

- A. Capacity of V-belt drives at rated RPM shall be not less than 150 percent of motor nameplate horsepower rating.
- B. V-belt drive combinations shall be limited to A, B, C, and fractional horsepower belts. 3V, 5V, and 8V belts and sheaves shall not be used.
- C. Drives requiring single belt application shall be of the adjustable pitch type. Multiple belt drives shall be of the non-adjustable type. All fixed pitch sheaves, including single groove fan sheaves, shall be of the bused type. Fixed bore sheaves will not be acceptable for non-adjustable pitch sheaves.

## 2.15 HEATING CABLE

- A. Furnish and install complete electrical heating cable on all pipe and fittings which may be exposed to freezing. Heat cable shall be of the self-regulating low temperature type with a heat output of 8 watts/ft. (27 BTUH/ft), and a weather-proof PVC sheath. The heating cable shall automatically adjust heat output to correspond with the heat loss rate. Cable shall be UL and FM approved for use in rainwater downspout ice melting applications, and for freeze Protection on exterior piping systems.
- B. Cable system shall be furnished with power termination, end seal kits, splice and tee fittings, and all accessories required for a complete installation.
- C. Thermon, Raychem, or prior approved equal.

## 2.16 MAGNETIC STARTERS

- A. Contractor furnishing "packaged equipment" with 1/2 HP and larger motors shall furnish factory-mounted magnetic starters. Magnetic starters shall provide both overload and undervoltage protection and shall have integral hand-off-auto switch, auxiliary contacts, and pilot. All motors installed under this contract shall have a disconnect switch in the immediate vicinity of the motor. Starters on three phase motors shall protect all three legs of the circuit. Starters to be Cutler-Hammer, Square "D", or Westinghouse.
- B. Starters for all motors on other than "packaged equipment" which are furnished under the mechanical section of the work will be installed by the electrical contractor.
- C. Starters shall be two-speed type or explosion-proof type where required.
- D. Provide a heater index bound in the O & M manuals for all starters furnished on the project.

## 2.17 MISCELLANEOUS ITEMS

- A. Motors:
  - 1. Motors shall be furnished and installed under the applicable Mechanical Sections of the Specifications.
- B. Each motor shall be provided with a nameplate for the electrical characteristics shown on the Drawings or as otherwise noted.
- C. Motors shall be constructed and rated to deliver full nameplate capacity at the project altitude.
- D. Horsepower shall be at least equal to that shown on the drawings. Where equipment is submitted and approved for the installation which requires larger motor sizes than shown, the wire and starter sizes shall be increased and means provided for operation and control suitable for the larger motors with no increase in cost to the Owner.
- E. Unless otherwise specified, or required for controller sequencing, all motors over 5 HP shall be high efficiency type, and all fractional HP single phase motors 1/2 HP & under shall be permanent split capacitor (PSC) type.

- F. Premium efficiency motors shall be based on CEE premium efficiency criteria for OPD motors at 1800 RPM.

| HORSEPOWER | NEMA PREMIUM EFFICIENCY |
|------------|-------------------------|
| 5          | 89.5%                   |
| 7.5        | 91.0%                   |
| 10         | 91.7%                   |
| 15         | 93.0%                   |
| 20         | 93.0%                   |
| 25         | 93.6%                   |
| 30         | 94.1%                   |
| 40         | 94.1%                   |
| 50         | 94.5%                   |

- G. Motors for V-belt drives shall be provided with cast iron or steel base, with slide rail and adjustable screw device and shall be isolated by rubber-in-shear devices.
- H. Motors shall have sufficient capacity to start and operate the machine it drives without exceeding the motor nameplate rating at the speed specified or at any speed and load which may be obtained by the drive actually furnished.
- I. Motors provided with automatic control shall be capable of making as frequent starts as the control device may demand. Motors not provided with automatic control shall be capable of making not less than 4 starts per hour.
- J. All belt-connected motors, regardless of size, shall be equipped with shafts and bearings that will withstand both the normal belt pull of the drive furnished and the momentary or continuous overloads due to acceleration of incorrect belt tension.
- K. Motors shall be air cooled and shall be guaranteed to operate continuously at 115% of full load with temperature rise in any part not to exceed 40 degrees C above the ambient air temperature.
- L. Motors shall be open drip-proof or totally enclosed fan cooled type as required and shall be commercially dynamically balanced and tested at the factory before shipment.
- M. Motors shall be selected for quiet operation. Sound power levels shall be within NEMA MGI-12.49.
- N. Motors shall comply with requirements of ANSI C 50, NEMA MG-1, and all NEMA standards.
- O. Motors controlled by variable frequency drives shall have characteristics which are fully compatible with the drives to which they are connected. Provide written confirmation of coordination with VFD supplier.
- P. Approved Manufacturers: Allis-Chalmers, Century, Gould, Lincoln, Reliance, Westinghouse, U.S.

## 2.18 SEISMIC RESTRAINTS

- A. All Division 22 and 23 equipment, piping, and ductwork shall be anchored and seismically restrained as required by the IBC for Seismic Zone D, NFPA 90A (current edition), UL Standard 181, Tri-services Manual Fagel Et Al 1973, and the SMACNA Guidelines for seismic restraints of mechanical systems.

- B. The Division 23 contractor shall be responsible for supplying and installing equipment, vibration isolators, flexible connections, rigid steel frames, anchors, inserts, hangers and attachments, supports, seismic snubbers and bracing to comply with Seismic Zone D of the International Building Code.
- C. All supports, hangers, bases, anchorage and bracing for all isolated equipment shall be designed by a professional engineer employed by the restraint manufacturer, qualified with seismic experience in bracing for mechanical equipment.
- D. Shop drawings submitted for earthquake bracing and anchors shall bear the Engineer's signed professional seal.
- E. The above qualified seismic engineer shall determine specific requirements on equipment anchorage and restraints, locations and sizes based on shop drawings for the mechanical equipment which have been submitted, reviewed and accepted by the Owner's representative for this project.
- F. The Division 23 contractor shall require all equipment suppliers to furnish equipment that meets the seismic code, with bases designed to receive seismic bracing and/or anchorage. All isolated mechanical equipment bracing to be used in the project shall be designed for the equipment shop drawings and certified correct by the equipment manufacturer for Seismic Zone D with direct anchorage capability.
- G. Submit shop drawings, calculations, and printed data for the following items under provisions of the General Conditions of the Contract:
  - 1. Complete engineering calculations and shop drawings for all vibration and seismic requirements for all equipment to be isolated and restrained.
  - 2. The professional seal of the engineer who is responsible for the design of the Vibration and Seismic restraint System for isolated equipment.
  - 3. Details for all the isolators and seismic bracing with snubbers proposed for items in this specification and on the drawings.
  - 4. Details for steel frames, concrete inertia bases, and anchors to be used in conjunction with the isolation of the items in this specification and drawings.
  - 5. Clearly outlined procedures for installing and adjusting the isolators, seismic bracing anchors and snubbers.
  - 6. The location of all restraints of pipes and ducts with the locations shown on a floor plan noting the size and type of anchorage and restraint to be used.
- H. Snubbers:
  - 1. Snubbers shall be double acting and consist of interlocking steel members restrained by replaceable shock absorbent elastomeric materials a minimum of 3/4 inch thick.
  - 2. Snubbers shall be manufactured with an air gap between hard and resilient material of not less than 1/8 inch nor more than 1/4 inch.
  - 3. A one "g" minimum vertical and lateral level shall be used in the design of all snubbers restraining isolated equipment.
- I. Design and Installation:
  - 1. General: All mechanical equipment, piping and ductwork shall be braced, anchored, snubbed or supported to withstand seismic disturbances and remain operational. Provide all engineering, labor, materials and equipment for protection against seismic disturbances as specified herein.

2. All equipment not anchored directly to the floors shall be restrained by cables as designed and furnished by the Restraint Manufacturer.
3. Isolated Equipment: All vibration isolated equipment shall be mounted on rigid steel frames or concrete bases as described in the vibration control specifications unless the equipment manufacturer certified direct attachment capability. Each spring mounted base shall have a minimum of four all-directional seismic snubbers that are double acting and located as close to the vibration isolators as possible to facilitate attachment both to the base and the structure. Snubbers shall be installed with factory set clearances.
4. Piping: All isolated and non-isolated piping 2-1/2" I.D. and larger shall be protected in all planes by restraints to accommodate thermal movement as well as restrain seismic motion. Where necessary the piping restraints shall be resiliently attached to the piping with vibration dampening inserts to prevent the transmission of vibration to the building structure. Locations shall be as scheduled and shall include but not be limited to:
  - a. At all drops to equipment and at flexible connections.
  - b. At all 45 deg. or greater changes in direction of pipe.
  - c. At horizontal runs of pipe, not to exceed 30 ft. O.C. spacing.
5. Piping shall be restrained by a cable restraining system using a minimum of two cables at all restraint points.
6. Piping in mechanical rooms shall have additional restraints as scheduled.
7. Non-Isolated Equipment: The restraint systems for all non-isolated equipment are to be installed to resist stresses produced by lateral forces according to Sec. 2312 of the Uniform Building Code with an Occupancy Importance Factor of 1.5, a Seismic Zone Factor of  $Z = 0.75$  for Zone D and a Horizontal Force Factor for Elements of Structures and Nonstructural Components of  $C_p = 0.3$ . In addition, the vertical forces restraint requirement shall be half the value of the horizontal forces. All equipment not anchored directly to floors shall be restrained by cables as designed and furnished by the Restraint Manufacturer.
8. Acceptable Manufacturers and Suppliers for Non-Isolated Systems:
  - a. Mason Industries, Inc.
  - b. Korfund
  - c. Amber/Booth Company
  - d. Vibration Mountings and Control Company
9. Manufacture and design of restraints and anchors for internally isolated equipment shall be the responsibility of the manufacturer of the vibration isolators furnished with the equipment.
10. Piping, ductwork, and equipment without moving parts shall be restrained as shown and noted on the drawings. Locations shown are approximate and shall be coordinated with other trades and with the structural engineer at the job site.

J. Field Services:

1. The seismic restraint manufacturer's engineer shall inspect the final installation and shall certify that all seismic restraints have been installed per manufacturer's instructions and applicable codes and standards.

## 2.19 CHEMICAL CLEANING

- A. Prior to operating any heating or cooling systems, all piping systems and components shall be chemically cleaned and flushed by an experienced chemical cleaning service approved by the Engineer.
- B. Pipe Exterior: Wash and wipe pipe exterior to remove construction dirt, loose scale and flux.
- C. Pipe Interior: Flush pipe interior with clean water. Continue flushing until the piping system runs clean. After flushing, inspect strainer screens, refrigeration machine water boxes, piping low points, and tank drains to determine the presence of construction debris. If debris is found, disassemble equipment and remove debris. Re-flush the system and re-inspect.
- D. Do not operate centrifugal pumps until the system has been cleaned and flushed.

## 2.20 GLYCOL FILL SYSTEM

- A. Furnish and install the glycol fill system detailed on the drawings.
- B. The fill system shall be complete with 55-gallon translucent polypropylene tank with cover. High pressure metering pump with controls, liquid level alarm sensors to sound local alarm on high -or- low tank level and prevent pump operation on low liquid level.
- C. Controls shall cycle on feed pump when system pressure falls below low pressure set point and shall cycle off when system pressure exceeds high pressure set point.
- D. Provide operating controls for all glycol feed units on the heating water systems.
- E. Provide one (1) hand pump to owner for transfer of glycol from drums to tank.
- F. Electrical contractor to provide a 110-volt duplex outlet for glycol feed system. Control contractor to wire all low voltage wiring.
- G. System shall be Power Engineering, West Chemical, or Pulsafeeder.

## 2.21 GLYCOL FILL

- A. This contractor shall furnish all propylene glycol solution for the heating water system to provide a 30% volumetric concentration. Glycol solution shall be Dowfrost HD or Jeffcool P150 HD low toxicity polypropylene with extra strength corrosion inhibitors and colored dye for identification. This contractor shall provide 100 gallons of 30% glycol solution in addition to the 30% solution initial fill, for use in maintaining the system.
- B. Contractor shall provide the Engineer a complete system analysis at the time of final inspection. Analysis shall be included in the building O&M Manuals.
- C. Fill water used for mixing glycol shall be of an approved level of chlorides and sulfates as allowed by Glycol manufacturer. Soft water shall not be used to mix glycol.

## 2.22 GREASING AND OILING

- A. Prior to placing the equipment in operation, the bearings on all motors, fans, pumps, etc., shall be properly lubricated with a lubricant suitable for the service.

- B. Lubrication instruction tags are to be left on "all" bearings and equipment for the Owner's future use. Only lubricants recommended by the equipment manufacturers shall be used.
- C. It shall be incumbent on the contractor to operate the building equipment used for temporary heat, etc., in a prudent manner to ensure that when the building is turned over to the Owner all equipment is in a "first-class" condition.
- D. Equipment shall not be operated unless:
  - 1. All safety devices are installed and functioning properly.
  - 2. Filters are in place on fan systems. Filters to be new and clean.
  - 3. Equipment is properly greased and oiled.
  - 4. Belts and drives are properly aligned and adjusted.
- E. The contractor shall maintain a current "equipment maintenance" chart in the construction shack at all times. This chart shall be posted in a conspicuous place and shall include all items of maintenance necessary for proper operation of the equipment.
- F. Equipment used for temporary heat and cooling shall, if requested by the Contracting officer, have tube bundles pulled by contractor for Owner inspection prior to acceptance.

#### 2.23 VALVE TAGGING

- A. All valves shall be designated by distinguishing numbers and letters on required charts and diagrams. The contractor shall furnish and install approved brass tags for all designated items, which numbers and letters on the tags corresponding to those on the charts and diagrams.
- B. Brass tags shall be not less than 1-1/2" diameter with depressed black filled numbers not less than 1/2" high and black filled letters not less than 1/4" high. Tags shall be securely fastened to valves with approved brass "S" hooks, or brass jack chain, in a manner to permit easy reading. Zips ties are not acceptable. Do not attach to valve wheel. Brass tags shall be as manufactured by Seton Name Plate Company, New Haven, Connecticut, or approved equal.
- C. Each valve shall have an identifying number identifying the unit. Standard identifications may be used for identifying type of service or fluid in pipe. The contractor shall submit his system of identification to the Owner's representative for approval prior to ordering. Any work done without this approval is done at the contractor's risk.
- D. Charts of all valves shall be furnished to the Owner's representative by the contractor.
- E. A chart to be mounted in a frame with clear glass front and secured on the wall in the main Mechanical Equipment Room.
- F. The second chart shall be prepared for use outside of the equipment room, and to be provided with an approved heavy transparent plastic closure for permanent protection. Two (2) holes to be punched at top of plastic closure to allow for affixing approximately an 8" length of nickel-plated bead chain. Each hole to be reinforced by means of a small brass or nickel grommet. Plastic closure shall be as manufactured by Seton Name Plate Company, New Haven, Conn., or approved equal.

G. Identify all valves. A sample identification shall be as follows:

VALVE IDENTIFICATION CHART

| NUMBER | DESCRIPTION  | LOCATION                | NORMAL POSITION |
|--------|--|-------------------------|-----------------|
| 1.     | Cold Water Supply to Water Heater                  | Mech. Room #121         | Open            |
| 2.     | Cold Water Supply to Hose                          | Room #13                | Open            |
| 3.     | Cold Water Supply to Equip. in Room #12            | Room #18                | Open            |
| 4.     | Hot Water Supply to Toilet Room #212               | Chase #210              | Open            |
| 5.     | Air Vents - Cooling Coil #12 (2 required)          | Fan Room 3122           | Closed          |
| 6.     | Heating Hot Water Balancing Valve (Southwest Zone) | Above Ceiling Room #412 | Marked On Valve |

H. The above room numbers shall be the room numbers actually used.

I. Mechanical Equipment & Ductwork:

All mechanical equipment, including meters, fans, pumps, and other devices shall be identified with signs made of laminated plastic 1/8" or larger engraved letters. Signs shall be securely attached by rustproof screws or some other permanent means (no adhesives).

J. Information on sign shall include name of equipment, rating, maintenance instructions, and any other important data not included on factory attached nameplate.

K. Signs shall be attached to equipment so they can be easily read.

L. Identify all ducts exposed in mechanical equipment rooms and in ducts and pipe chases. Sample duct identification shall be as follows:

1. "Cold Duct - High Pressure - To Second Floor System"
2. "Exhaust Duct - Toilet Room - To EF-3"
3. "Ventilation Air Duct - To Utility Room #228"

M. Ducts shall be labeled at all wall penetrations and at connections to equipment.

2.24 PAINTING

A. Mechanical Contractor: All equipment which is to be furnished in factory prefinished conditions by the mechanical contractor shall be left without mark, scratch, or impairment to finish upon completion of job. Any necessary refinishing to match original shall be done. Do not paint over nameplates, serial numbers, or other identifying marks.



- B. Mechanical Contractor: Spot painting for application of pipe and equipment identification markers. All piping exposed to weather.
- C. Painting Contractor: All insulated piping and all piping in equipment rooms of finished areas shall be painted, as required by the painting specifications. Colors to be selected by owner.
- D. Coding, Pipe Identification & Painting:
- E. All pipes are to be labeled and color coded with contents clearly identified and arrows indicating direction of flow. Pipes shall be identified at the following locations:
  - 1. Adjacent to each valve.
  - 2. At every point of entry and exit where piping passes thru wall or floor.
  - 3. Every 50 feet on long continuous lines.
  - 4. On each riser and junction.
  - 5. Adjacent to all special fittings or devices (regulating valves, etc.)
  - 6. Connection to equipment.
- F. Apply markers to they can be read from floor.
- G. Labels and markers shall be of the self-sticking, all temperature permanent type as manufactured by W. H. Brady Co., 727 West Glendale Avenue, Milwaukee, Wisconsin, or Seton Name Plate Corp., 592 Boulevard, New Haven, Connecticut.
- H. Pipe color coding shall be uniform throughout.
- I. Background colors shall be as follows:
 

|              |  |
|--------------|--|
| Yellow:      | Dangerous Materials (natural gas condensate, etc.)                               |
| Bright Blue: | Protective Materials (filtered water)  |
| Green:       | Safe Materials (chilled water, cold water, instrument air, sanitary sewer, etc.) |
- J. Letters of identification legend shall be 2" high for pipes 3" and larger, and 1" high for pipes 2-1/2" and under.
- K. Markers shall be installed in strict accordance with the manufacturer's instructions.
- L. On chalky and loose insulation, soft, porous, fiber-filled or fiberglass coverings, a spiral wrap of pipe banding tape shall be made around the circumference of the pipe. Sufficient spiral wraps shall be made to accommodate the horizontal dimension of the pipe marker.
- M. On bare pipes, painted pipes, and pipes insulated with a firm covering, pipe banding tape matching the background color of the marker shall be used for 360 deg. color coding. After applying pipe markers, wrap pipe banding tape around pipe at each end of marker. Tape should cover 1/4" to 1/2" of each end of marker and should overlap approximately 1/2" to 1" on itself. Be sure pipe surface is dry and free of dirt or grease before applying markers or banding tape.
- N. Stenciling may be used in lieu of the above labels and markers if finished application gives the same overall appearance, that is that stenciling is applied over a background color. If stenciling is used, letter heights, background colors, banding, and arrow shall be as specified above. Submit sample to Owner's representative before proceeding with work.

O. Plastic Marking Tape:

Provide and install continuous plastic tape over the top of all underground utilities. Tape shall be placed 1/2 way between finished grade and top of utility line.

- P. Plastic marking tape for underground utilities shall be acid and alkali-resistant Polyethylene film, 6 inches wide with minimum thickness of 0.004 inch. Tape shall have a minimum strength of 1750 psi lengthwise and 1500 psi crosswise. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 3 feet deep. The tape shall be of a type specifically manufactured for marking and locating underground utilities. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. Tape color shall be as specified in Table 1 and shall bear a continuous printed inscription describing the specific utility.

TABLE 1 – TAPE COLOR

|        |                               |
|--------|-------------------------------|
| Yellow | Gas, Oil, Dangerous Materials |
| Blue   | Water Systems                 |
| Green  | Sewer Systems                 |

Q. Ceiling Markers:

Use stick on ceiling markers on all accessible ceiling grid to indicate location of VAV boxes, valves, and dampers.

R. Color code as follows:

|        |                    |
|--------|--------------------|
| Yellow | HVAC               |
| Green  | Plumbing           |
| Blue   | Air                |
| White  | Duct Valves        |
| Orange | Electrical Devices |
| Red    | Fire               |

PART 3 – EXECUTION

3.1 COORDINATION

- A. All equipment and piping shall be arranged to allow for easy maintenance and access to service valves.
- B. Provide valves and unions or flanges at all pieces of equipment to allow maintenance.
- C. Install all automatic valves, sensor well, flow switches, etc., as directed by the control contractor.

3.2 TESTING

- A. All piping shall be tested in accordance with Section 230501 prior to applying insulation or concealing in partitions, wall, etc.

### 3.3 ACCESS

- A. All valves and equipment shall be located to allow easy access for inspection, service and maintenance, test and balance, and operation. If valves are installed in inaccessible locations, it shall be this contractor's responsibility to furnish and install access doors of a type approved by the owner's representative.
- B. Locate piping, valves, etc., to allow easy access to and maintenance of equipment. Do not block walkways, filter access, maintenance access, or tube-pull space in equipment rooms.

### 3.4 LOCATIONS & ARRANGEMENTS

- A. All pressure gages shall be so installed as to be easily readable from an eye level 5' -6" above the floor.
- B. Test plugs on flow measuring stations shall be unobstructed and shall be arranged in the piping per manufacturer's recommendations.
- C. All equipment and accessories shall be installed to facilitate proper service and maintenance in compliance with the manufacturer's recommendations.

### 3.5 WIRING BY THE ELECTRICAL CONTRACTOR

- A. It is the intent of these specifications that all line voltage electrical power wiring and power connections to equipment be furnished and installed by the electrical contractor, unless otherwise specified or shown on the drawings.
- B. The mechanical contractor shall coordinate actual job-site power requirements with the electrical contractor prior to installation of power wiring and electrical equipment.
- C. The electrical contractor shall provide necessary wiring to electric heat tape as required and shall coordinate with the mechanical contractor the location and capacity of required circuits.
- D. When mechanical system components are furnished with remote mounted control panels, alarm bells, alternators, etc. the electrical contractor shall run all required line voltage power wiring as directed by the mechanical contractor. It shall be the mechanical contractor's responsibility to coordinate the work and provide the necessary wiring diagrams.
- E. When exhaust fans are provided which are not controlled by the ATC contractor, they shall be wired to local line voltage wall switches. The wall switch locations shall be coordinated with the owner's representative.
- F. Line and low voltage control wiring will be furnished and installed by the ATC contractor in accordance with NEC and Division 26. Minimum 3/4" conduit.

### 3.6 STORAGE AND INSTALLATION OF MOTORS

- A. Handle motors carefully to prevent damage, denting and scoring. Do not install damaged motors or components; replace with new.
- B. Store motors and components in a clean, dry place. Protect from weather, dirt, water, construction debris, and physical damage.

- C. Install motors where indicated on the drawings and in accordance with manufacturer's drawings and in accordance with manufacturer's published installation instructions.
- D. Install each direct-connected motor such that it is securely mounted in accurate alignment. The drive must be free from both angular and parallel misalignment when both motor and driven machine are operating at normal temperatures. Provide each belt-connected motor with a securely mounted adjustable base to permit installation and adjustment of belts.

### 3.7 INSTALLATION OF ABOVE GROUND PIPING

- A. Provide piping systems of sizes indicated on the drawings. Systems shall be installed complete.
- B. Install piping systems in conformance with ANSI B31.
- C. Install piping to allow for expansion and contraction of the piping systems. Provide offsets and swing joint connections at coils, pumps and other equipment to eliminate undue strain to the equipment connections.
  - 1. Connect flanges and tack weld piping systems in place before full circumferential welds are made.
  - 2. Springing of piping at equipment connections will not be permitted.
  - 3. The use of "cold-spring" is not permitted.
- D. Branch connections to up feed systems shall be made at the top or at a 45-degree angle above the centerline. Branch connections for down feed systems shall be made at the bottom or at a 45-degree angle below the centerline.
- E. Install water piping with a pitch or slope of not less than 1-inch in 40 feet.
  - 1. Provide 3/4-inch diameter plugged drain valves at each low point in mechanical rooms.
- F. High Points: At each high point of the piping system provide a 3/8-inch diameter plugged globe valve.
  - 1. Where high points are located in an inaccessible position, provide a 3/8-inch diameter bleed line from the high point of the piping system and extend to an approved location, with access. Anchor bleed piping and provide 3/8-inch diameter globe valve.
- G. Support, anchor, and guide piping systems to preserve piping flexibility and the isolation effects of sound and vibration isolation hangers.
- H. Conform to the welding and welder qualification requirements paragraph of this Section.
  - 1. Perform welding in conformance with ANSI B31.1.
  - 2. Perform welding in ambient temperatures above 0 degrees F.
  - 3. Ream and clean ends of piping.
  - 4. Support piping align and tack weld making allowance for pipe pitch and insulation. Temporarily block piping at hangers.
  - 5. Use welding pipe clamps on piping 4-inch diameter and larger and verify alignment before welding.
- I. All installed pipelines shall be straight, free from dents, scars and burrs, with ends reamed smooth and shall remain straight against strains tending to cause distortion during system operation. The Contractor shall make proper allowance for pipeline expansion and contraction so that no unsightly distortion, noise, damage or improper operation will occur.

- J. Piping shall be run in a neat and efficient manner and shall be neatly organized. Piping shall be run parallel or at right angles to the building walls or construction. The Contractor shall study the general, electrical, and other drawings to eliminate conflict of piping with structure, sheet metal, lighting, or other services. Unless specified otherwise, no piping shall be exposed in a finished room, all changes in direction shall be made with fittings.
- K. All piping shall be clean and free from acids and loose dirt when installed.
- L. Temporary pipe plugs of rags, wool, cottons, waste or similar materials shall not be used.
- M. All piping shall be so arranged to not interfere with removal of other equipment or devices and shall not block access openings, etc.
- N. Piping shall be arranged to facilitate equipment maintenance.
- O. Flanges or unions shall be provided in the piping at connections to all items of equipment.
- P. All piping shall be so installed to insure noiseless circulation.
- Q. All valves and specialties shall be so placed to permit easy operation and access, and all valves shall be regulated and adjusted at the completion of the work.

3.8 VALVE INSTALLATION

- A. After piping system has been tested and put into service, but before final testing, adjusting and balance, inspect each valve for possible leak. Open and close each valve to verify proper operation.

3.9 INSTALLATION OF UNDERGROUND PIPING

- A. Coordinate the routing and location of all underground piping with building footings. See structural drawings.
- B. Outside pipe placed underground shall be buried deep enough to protect against freezing.
- C. Depth of bury of services shall be:

|           | Minimum | Preferred |
|-----------|---------|-----------|
| Sewer     | 48"     | 48"       |
| Rainwater | 48"     | 48"       |
| Water     | 60"     | 60"       |
| Gas       | 36"     | 36"       |
| Fire      | 60"     | 60"       |

- D. Services shall be buried at the "preferred" depth unless site conditions require the "minimum" depth as listed above.

- E. Handling: Pipe and accessories shall be handled so as to insure delivery to the trench in sound, undamaged condition. Particular care shall be taken not to injure the pipe coating. If the coating or lining of any pipe or fitting is damaged, the repair shall be made by the Contractor at his expense in a satisfactory manner. No other pipe or material of any kind shall be placed inside a pipe or fitting after the coating has been applied. Pipe shall be carried into position and not dragged. Use of pinch bars and tongs for aligning or turning pipe will be permitted only on the bare ends of the pipe. The interior of pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved method. Before installation, the pipe shall be inspected for defects. Material found to be defective before or after laying shall be replaced with sound material without additional expense to the owner. Rubber gaskets that are not to be installed immediately shall be stored in a cool dark place.
- F. Coated and wrapped steel pipe shall be handled in conformance with AWWA Standard C203.
- G. Cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise recommended by the manufacturer and authorized by the Contractor Officer, cutting shall be done with an approved type mechanical cutter. Wheel cutters shall be used when practicable.
- H. Copper tubing shall be cut square and all burrs shall be removed.
- I. Locating: Where the location of the water pipe is not clearly defined by dimensions on the drawings, the water pipe shall not be laid closer horizontally than 10 feet from a sewer except where the bottom of the water pipe will be at least 12 inches above the top of the sewer pipe, in which case the water pipe shall not be laid closer horizontally than 6 feet from the sewer. Where water lines cross under gravity-flow sewer lines, the sewer pipe for a distance of at least 10 feet each side of the crossing shall be fully encased in concrete or shall be made of pressure pipe with no joint located within 3 feet horizontally of the crossing. Water lines shall, in all cases, cross above sewage force mains or inverted siphons and shall be not less than 2 feet above the sewer main. Joints in the sewer main, closer horizontally than 3 feet to the crossing, shall be encased in concrete.
- J. Water lines shall not be laid in the same trench with sewer lines, gas lines, fuel lines, or electric wiring.
- K. Copper tubing shall not be installed in the same trench with ferrous piping materials.
- L. Nonferrous metallic pipe: Where nonferrous metallic pipe, e.g., copper tubing, crosses any ferrous piping material, a minimum vertical separation of 12 inches must be maintained between pipes.
- M. Plastic pipe shall be insulated against heat from steam lines, water lines, or other heat sources.
- N. Placing and Laying: Pipe and accessories shall be carefully lowered into the trench. Under no circumstances shall any of the materials be dropped or dumped into the trench. Care shall be taken to avoid abrasion of the pipe coating. Pipe shall be laid with the bells facing in the direction of laying. The full length of each section of pipe shall rest solidly upon a compacted sand bed, with recessed excavated to accommodate bells, couplings, and joints. Pipe that has the grade or joint disturbed after laying shall be taken up and re-laid. Pipe shall not be laid in water or when trench conditions are unsuitable for the work. Water shall be kept out of the trench until jointing is completed. When work is not in progress, open ends of pipe, fittings, and valves shall be securely closed so that no trench water, earth, or other substance will enter the pipes or fittings. Where any part of the coating or lining is damaged, the repair shall be made by the Contractor at his expense in a satisfactory manner. Pipe ends left for future connections shall be valved, plugged, or capped, and anchored, as required.

- O. Where prescribed by the manufacturer of the pipe, gaskets shall be placed in the groove on the end of the pipe before the pipe is placed in the trench. After the pipe has been forced together, the position of the rubber gasket shall be checked with a feeler gage in accordance with the pipe manufacturer's recommendations.
- P. Pipe shall be protected during handling against impact shocks and free fall and the pipe interior shall be free of extraneous material.
- Q. Laying of gravity drain shall proceed upgrade with the spigot ends of bell-and-spigot pipe and tongue-and-groove pipe pointing in the direction of the flow. Each pipe shall be laid accurately to the line and grade shown on the drawings. Pipe shall be laid and centered so that the pipe has a uniform invert. As the work progresses, the interior of the pipe shall be cleared of all superfluous materials.
- R. Before making pipe joints, all surfaces of the portions of the pipe to be joined shall be clean and dry. Lubricants, primers, and adhesives shall be used as recommended by the pipe manufacturer. The joints in gravity drain lines shall then be placed, fitted, joined, and adjusted so as to obtain the degree of water tightness required.

### 3.10 EXCAVATION

- A. Excavation of every description and of whatever substances encountered shall be performed to the lines and grades indicated. During excavation, material satisfactory for backfilling shall be stockpiled in an orderly manner at a distance from the banks of the trench sufficient to avoid overloading and to prevent slides or cave-ins. Adequate drainage shall be provided for the stockpiles and surrounding areas by means of ditches, dikes, or other approved methods. The stockpiles shall also be protected from contamination with unsatisfactory excavated material or other material that may destroy the quality and fitness of the suitable stockpiled material. If the Contractor fails to protect the stockpiles and any material becomes unsatisfactory as a result, such material, if directed, shall be removed and replaced with satisfactory on-site or imported material from approved sources at no additional cost to the owner. Excavated material not required or not satisfactory for backfill shall be removed from the site. Grading shall be done as may be necessary to prevent surface water from flowing into the excavation, and any water accumulating therein shall be removed so that the stability of the bottom and sides of the excavation is maintained. Sheet piling and shoring for the work and for the safety of personnel shall be in compliance with applicable safety standards.
- B. Trench Excavation: The trench shall be excavated as recommended by the manufacturer of the pipe to be installed. Trench walls below and above the top of the pipe shall be sloped, or made vertical, as recommended in the manufacturer's installation manual. The trench width below the top of the pipe shall not exceed that recommended in the installation manual. Where no manufacturer's installation manuals are available, trench walls below the top of the pipe shall be vertical, and trench walls above the top of the pipe shall be sloped as required to properly complete the work. Trench width below the top of the pipe shall not exceed 24 inches plus pipe outside diameter (O.D.). Where recommended trench widths are exceeded, redesign shall be performed by the Contractor using stronger pipe or special installation procedures. The cost of this redesign and the increased cost of the pipe or installation procedures shall be borne by the Contractor without additional cost to the Owner.
- C. Bottom Preparation: The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. Stones of 3 inches or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, shall be removed to avoid point bearing.

- D. Removal of Unyielding Material: Where overdepth is not indicated and unyielding material is encountered in the bottom of the trench, such material shall be removed 4 inches below the required grade and replaced with suitable materials.
- E. Removal of Unstable Material: Where unstable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with select granular material. When removal of unstable material is required due to the fault or neglect of the Contractor in his performance of the work, the resulting material shall be excavated and replaced by the Contractor without additional cost to the Owner.
- F. Excavation for Appurtenances: Excavation for manholes, catch basins, inlets, or similar structures shall be of sufficient size to permit the placement and removal of forms for the full length and width of structural footings and foundations as shown. Removal of unstable material shall be as specified above. When concrete or masonry is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

### 3.11 BACKFILLING

- A. Backfill material shall consist of satisfactory material. Backfill shall be placed in layers not exceeding 4 inches loose thickness for compaction by hand operated machine compactors, and 8 inches loose thickness for other than hand operated machines, unless otherwise specified. Each layer shall be compacted to at least 95 percent maximum density unless otherwise specified.
- B. Trenches shall be backfilled to the grade shown. The trench shall be backfilled to 2 feet above the top of the pipe prior to performing the required pressure tests. The joints and couplings shall be left uncovered during the pressure test.
- C. Replacement of Material: Material removed from the bottom of the trench shall be replaced with 6" sand base prior to the installation of piping. Piping shall be encased in sand with a 6" top layer over the top of the piping.
- D. Initial backfill material shall be placed in layers of a maximum of 4 inches loose thickness and compacted with approved tampers to the density of the adjacent soil and to a height of at least 1 foot above the utility pipe or conduit. The backfill shall be brought up evenly on both sides of pipe for full length of the pipe. Care shall be taken to ensure thorough compaction of the fill under the haunches of the pipe. Backfill material in this portion of the trench shall consist of satisfactory material at a moisture content that will facilitate compaction free from stones of such size as recommended by the pipe manufacturer, or larger than 2 inches in any dimension, whichever is smaller, except that where the pipe is coated or wrapped for protection against corrosion, the backfill material shall be free of stones larger than 1 inch in any dimension, or as recommended by the pipe manufacturer, whichever is smaller.
- E. The remainder of the trench, except for special materials for roadways, shall be backfilled with satisfactory material. Backfill material shall be deposited and compacted as follows:
- F. Degree of Compaction: Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557, Method B or D.

### 3.12 INSTALLATION OF VALVES

- A. Gas Cocks: Provide and install gas cocks at connection to gas train for each gas-fired equipment item; and on risers and branches where indicated on the drawings. Locate gas cocks where easily accessible and where they will be protected from possible injury.



- B. Pressure Regulating Valves: Install pressure regulating valves in accordance with local utility company's requirements and manufacturer's installation instructions. Install gas shutoff valve upstream of each pressure regulating valve. Each pressure regulating valve shall have an independent vent piped to the outside of the building. Vents shall be terminated with an approved bug screen fitting.

### 3.13 INSTALLATION OF NATURAL GAS PIPING

- A. General: Install natural gas piping as shown on the drawings in accordance with NFPA 54 and as follows.
- B. Caulk spaces watertight between pipes and sleeves passing through exterior walls, slabs on grade and over crawl spaces, and waterproofed floors. Pack and seal spaces between pipes and sleeves passing through floors, walls, and ceilings of machine spaces, such as mechanical equipment, refrigeration, boiler, pump, fan, and machinery rooms at both ends of sleeve to provide an airtight acoustical barrier.
- C. Unless otherwise indicated, gas piping shall be run exposed. Where concealed piping is indicated, it shall be installed inside of a welded steel casing which is vented on both ends and in a location to permit access to the piping casing with a minimum amount of damage to the building.
- D. The gas supply pipe shall be of the size indicated on the drawings.
- E. A stop cock or tee handled gate valve, with cast-iron extension box and cover, shall be installed in the gas supply pipe near the curb. A brass gas cock shall be installed in the gas supply pipe just inside the building wall. If the gas supply pipe is larger than 2-inch size, a bronze mounted iron body gate valve may be provided in lieu of the brass cock.
- F. Joints shall be welded from the seismic shut-off valves to the gas train connections at the boilers. Other non-welded joints shall be made with graphite and oil or an approved graphite compound applied to the male thread only. After cutting, and before threading, pipe shall be reamed and all burrs shall be removed. Threads shall be accurately cut, and not more than three threads shall remain exposed outside each fitting after the joint has been made up. Each length of pipe shall be hammered and all scale shall be blown out before assembling. Threaded joints shall not be caulked to prevent or stop leaks.
- G. An approved type gas cock shall be installed in the branch connection to each riser and near each appliance. Plugged or capped outlets for future extensions or connections shall be provided where noted on drawings.
- H. Piping shall be graded not less than 1-inch in 40 feet of length to prevent trapping. The gas supply pipe from the main in the street to the meter shall grade up toward the meter. Horizontal lines from the meter to the risers shall grade down toward the risers and branches from risers to appliances shall grade up toward the risers and branches from risers to appliances shall grade up toward the appliances.
- I. A full-size tee fitting and a 6-inch long capped drip pocket shall be installed at the bottom of each riser or drop and at each low point in a horizontal gas line.

- J. Uncovered, exposed pipes shall be provided with plates at the point where they pass through floors, finished walls, and finished ceilings. Where necessary to cover beads of fittings, special deep escutcheons shall be provided in lieu of plates. Plates shall be not less than 0.018-inch thick. Wall and ceiling plates shall be secured with round head set screws, not with spring clips. Unless otherwise specified, plates shall be of the one-piece types. Wall and ceiling plates may be flat, hinged pattern.
- K. Unions shall be installed in the gas piping between the gas burning appliance and the gas shut-off valve serving the appliance.

### 3.14 REFRIGERATION PIPING INSTALLATION

- A. All gas piping and hanger/supports exposed to weather shall be painted by Division 15000 contractor.
- B. Refrigeration tubing shall be cut (with a pipe cutter) so ends are perfectly square and will "bottom" in fittings. There must be no gaps left thru which solder can run into the line. If a hack saw must be used, it shall always be guided with a miter box to ensure a square, even cut. Tubing shall be reamed to remove burrs, being careful not to expand tubing while reaming.
- C. The outside of the copper pipe and the inside of the fittings, where solder will be applied, shall be burnished. Fine crocus cloth or fitting brushes especially made for this type of work should be used. Surfaces shall be burnished until all dirt and oxide is removed. Cleaned surface should not be touched with hands or gloves.
- D. A light coat of brazing flux shall be applied to both pipe and fittings. Acid flux (such as muriatic or hydrochloric acid) shall not be used. The resulting corrosion would seriously affect the pipe and composition for brazing.
- E. Joint shall be heated to proper brazing temperature, being sure that it is uniformly hot so brazing material will flow to all parts of the joint. The brazing material shall be fed to the joint until a uniform line of brazing material appears around the pipe at the end of the fittings.
- F. Refrigerant piping shall be joined with "sil-fos" soldered joints. "Easy-Flow" solder may be used for connections at valves and specialties only.
- G. An oxy-acetylene torch shall be used for heating the joint for brazing. During brazing, the pipe and fittings must be kept full of an inert gas, N or CO<sub>2</sub> to prevent formation of scale.
- H. NOTE: Should the contractor be observed by the job superintendent or any authorized inspector soldering or brazing any part of a refrigeration piping system without proper circulation of inert gas thru the lines being worked on, it shall be assumed that the entire system was fabricated in such a manner, and all of the piping installed on that system shall be condemned and promptly removed from the job site at the expense of the contractor.
- I. When solenoid stop valves are being installed, the coil shall be removed to prevent the heat of soldering from ruining the insulation. When sight glasses are being installed, the glass should be removed to prevent cracking. No heat shall be applied near the bulb of the expansion valve or any other place where an excessive temperature may cause damage.
- J. All of the foregoing piping shall be examined, and if found to leak, shall be made tight and test repeated until the system is proved tight. All tests shall be verified by the Owner's representative.

- K. After all refrigeration piping and connections are completed, make a leak test by filling the system with freon and test for leaks with an electronic leak detector. Evacuate all piping to 500 microns and hold for 24 hours prior to final charging.
- L. Charge the system with clean, dry refrigerant until a proper operating charge has been added as determined by proper operation with a clean refrigerant stream at the sight of glass.
- M. Pipe covering shall not be installed, nor the piping anchored until testing is completed and all leaks have been properly eliminated.
- N. All refrigeration piping exposed the exterior shall be insulated and covered with aluminum jacketing.

### 3.15 INSTALLATION OF THERMOMETERS AND THERMOMETER WELLS

- A. General: Install thermometers and thermometer wells at locations shown on the drawings and where specified. Install thermometers so that they can be read by a person standing on the floor and with normal illumination.
- B. Locations: Install thermometers and thermometer wells at the following locations, and elsewhere as indicated.
  - 1. At the inlet and the outlet of each hydronic zone.
  - 2. At the inlet and the outlet of each hydronic boiler and cooling tower.
  - 3. At the inlet and the outlet of each hydronic coil in air handling units.
  - 4. Thermometer Wells: Drill and tap pipes 5-inch and larger for installation of wells. Provide tees or reinforced welding fittings on pipes smaller than 5-inch for installation of wells. Provide oversize tees or enlarge pipe smaller than 3-inch at points where wells are installed to avoid restriction of flow.

### 3.16 INSTALLATION OF PRESSURE GAUGES

- A. General: Install pressure gauges at locations shown on the drawing and where specified.
- B. Locations: Install pressure gauges in the following locations, and elsewhere as indicated.
  - 1. At the suction and the discharge of each pump.
  - 2. At the discharge of each pressure reducing valve.
  - 3. At the water service outlet.
- C. Pressure Gauge Cocks: Provide stem mounted pressure gauges with T-handle cocks and pressure snubbers.

### 3.17 INSTALLATION OF FLOW METERS

- A. General: Install flow meters at locations shown on the drawings and where specified. Install in accordance with ASME recommendations for flow meters.
- B. Locations: Install flow meters in the following locations, and elsewhere as indicated.
  - 1. At the discharge of each pump.
  - 2. At the inlet of each hydronic coil in built-up central systems.

- C. Piping: Install piping in the exact locations and arrangement, both upstream and downstream of primary elements, as required by the manufacturer's published literature. Provide any necessary piping changes required for certification without additional cost.
- D. Horizontal Pipe: Provide the connection nipples at, or slightly above, the horizontal centerline of the pipe to minimize the entrance of gases and impurities when flow is measured in horizontal pipe.
- E. Taps: Provide taps with shut-off valves and quick connecting hose fittings for portable meters or double-ferrule compression fittings for connection to tubing for permanently located meters or recorders.
- F. Portable Flow Meter Connections: Install connections for attachment to portable flow meter hoses that are readily accessible.

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## SECTION 23 3000

### AIR DISTRIBUTION

#### PART 1 – GENERAL

##### 1.1 SCOPE

- A. Work shall include the air distribution, ventilation, and exhaust duct systems, and all materials, equipment, and labor required to complete the systems shown on plans and specified herein.

##### 1.2 **See specifications section 230100-10.3.3.E & 230100-10.3.3.F for factory training requirements.**

#### PART 2 – PRODUCTS

##### 2.1 GENERAL

- A. Construct all ducts, plenums, etc., of the gauges specified in the latest editions of the applicable SMACNA manuals, unless otherwise shown. Sheets shall be free from blisters, slivers, pits, and imperfectly galvanized spots.
- B. Duct construction and installation details shall comply with the latest edition of the SMACNA Duct Construction Standards.
- C. Ducts from the fan unit discharge to VAV terminal boxes shall be constructed to meet the requirements of a +4-inch pressure class. All other supply air ducts shall be designed to meet the requirements for +2-inch pressurized ducts. All exhaust ducts shall be -2-inch suction ducts.

##### 2.2 +4" PRESSURE CLASS DUCTWORK

- A. All ductwork on the discharge side of Air Conditioning units to the terminal boxes shall be +4" pressure class duct. It is the essence of the duct system to have a minimum pressure loss. Therefore, ducts shall be run in a straight line and shall be run so that the lowest beam or obstruction shall generally determine the centerline of the straight run. Eccentric reducing transition shall be avoided, but may be used where space is a determining factor. Bends and elbows other than those shown on the drawings shall have the approval of the Owner's representative before installation. No pipes, conduits, or any other obstructions shall be run through +4" P.C. ductwork.

##### 2.3 ROUND DUCTWORK +4" PRESSURE CLASS

- A. The round +4" P.C. HVAC ductwork, fittings, and accessories shall be factory fabricated, spiral conduit. Ductwork may, when approved by the owner's representative, be fabricated in a 26 ga. standing rib configuration. The ducts shall be constructed of rust-resistant zinc-coated steel and shall be of the sizes called for on the drawings.
- B. All fittings in the round ducts shall be factory fabricated to match the spiral ducts and shall be of the same manufacturer.

- C. Round duct joints in diameters through 50 inches shall be sealed as follows:

Approved sealer equal to "Hard Cast" shall be applied to the coupling and fittings. Sealer is applied to the outside of the joint, extending 1 inch on each side of the joint bead and covering all screw heads. Plastic backed tape is immediately applied over the wet sealer.

- D. The duct sealer must be specifically formulated for the job sealing the field joints for high-pressure systems. The sealer shall be compatible with plastic-backed duct tape so the two shall cure and bond together. Samples of sealer and tape and the specification data sheets shall be submitted to the Owner's representative for approval.
- E. Flanged joints shall be sealed by Neoprene Rubber Gaskets.

## 2.4 ACCESS DOORS AND PANELS

- A. Location: Provide access doors in casings, plenums, and ducts where shown on the drawings and where specified for ready access to operating parts including fire dampers, smoke dampers, valves, and concealed coils.
- B. Pressure Clarification: Construct and install access doors in accordance with SMACNA Standards to suit the static pressure classifications and the locations where installed.

- C. Access Doors in Ducts: Provide and size doors as follows:

1. Minimum 24-inch by 24-inch clear opening.
2. When field conditions require an access opening smaller than 16-inch by 12-inch, provide a 24-inch long removable section of casing or duct, secured with quick acting locking devices, 6 inches on centers, to permit ready access without dismantling other equipment.

- D. Door Requirements: Provide doors in casings and duct as follows:

1. Arrange doors so that system air pressure will assist closure and prevent opening when the system is in operation.
2. Coordinate doors and equipment to provide unrestricted passage through clear door opening, without removal of any equipment.
3. Where pressure regulating dampers are installed in ducts or plenums, provide access doors with a clear wire glass observation port, 6-inch by 6-inch minimum size. Anchor port with structural metal frame, resilient gaskets and stainless-steel bolts.
4. Hinges for doors in zinc coated or aluminum construction shall be steel or iron, zinc coated with brass pins.
5. Hinges for doors in copper, copper nickel alloy construction shall be all brass.

## 2.5 CLOSURE COLLARS

- A. A duct ending at a wall or partition shall have the edge turned back to form a closure collar and flanged tight to the wall or partition so that no sharp or ragged edge appears.

## 2.6 FLASHING

- A. Where ducts pierce roof construction, the flashing shall be provided as part of Division 7.

- B. The equipment bases and duct opening bases on the roof shall be constructed by this Contractor as shown on the drawings. The base shall be constructed to fit the equipment approved for construction. This Contractor shall construct and install a weatherproof inverted pan over the wood bases to act as a counter flashing and weatherproof hood for the base. All openings through the pan for equipment mounting shall be sealed weathertight with lead washers.

## 2.7 TEST HOLES IN DUCTWORK

- A. Test holes for testing air quantities in ducts shall be installed at locations to be specified by the Balancing Contractor. Rubber stoppers shall be provided for closing the test holes. Where these holes are installed in insulated ductwork, a removable plug of approved insulation material shall be provided. An instrument port shall be provided in the following locations for each fan system.
  - 1. Return air shaft and/or duct upstream of sound traps
  - 2. Return air fan plenum
  - 3. Main return air duct upstream of fresh air dampers
  - 4. Mixed air plenum
  - 5. Supply fan plenum
  - 6. Additional ports are to be installed in locations determined by the Owner's representative.
- B. Instrument ports shall be die-cast with screwed cover for the insulation thickness specified. Ports shall be located outside of the plenum with 20-gauge sheet metal sleeve of the same size as the port opening, passing through insulation where ducts have interior insulation.

## 2.8 CLEANOUT OPENINGS

- A. Duct systems shall have cleanout openings equipped with tight fitting sheet metal doors. Doors shall be tightly latched without the use of tools.

## 2.9 FIRE-RESISTIVE ACCESS OPENING

- A. When cleanout openings are located in ducts within a fire-resistive shaft or enclosure, access openings shall be provided in the shaft or enclosure at each cleanout point.
- B. These access openings shall be equipped with tight-fitting sliding or hinged doors which are equal in fire-resistive protection to that of the shaft or enclosure.

## 2.10 CLEARANCES

- A. Duct systems shall have a clearance from combustible construction of not less than 18 inches. This clearance may be reduced to not less than three inches, provided the combustible material is protected with materials approved for one-hour fire-resistive construction on the duct side.

## 2.11 EXHAUST OUTLETS

- A. Exhaust outlets shall extend thru the roof, unless otherwise noted. Such extension shall be at least two feet above the roof surface, at least 10 feet from any adjacent building, property line, or air intake opening into any building, and shall be located at least 10 feet above the adjoining grade level.



## 2.12 BRANCH TAKEOFFS

- A. Branch takeoffs shall be as shown on the drawings, and shall be fitted with adjustable lock balancing dampers, complete with locking quadrants. Where dampers are not accessible for adjustment from above, concealed ceiling regulators with adjustable chrome-plated covers shall be provided.

## 2.13 WALL PENETRATIONS

- A. All ducts penetrating structural or architectural walls shall be sealed air and sound tight.

## 2.14 FIRE RATED SURFACE PENETRATIONS

- A. All ducts penetrating fire rated surfaces shall be sealed as directed in 15050.

## 2.15 EXPOSED ROUND +2" PRESSURE CLASS

- A. All joints and fittings shall be sealed with thermo-fit duct band by Raychem or approved equal. Contractor shall take care to ensure that all joints and fittings are neat in appearance.

## 2.16 INSULATED DOUBLE WALL DUCTWORK

- A. Round duct and fittings shall be 2" double wall with a perforated liner as noted on plans. Duct shall be United McGill Accousti-K-27 or equivalent.
- B. Exposed exhaust ductwork shall be sealed and painted. Do not line or wrap.
- C. Location and height of all exposed duct shall be coordinated with architect prior to installation.

## 2.17 COOKING HOOD DUCTS

- A. Cooking hood ducts for Type I hoods shall be fabricated and installed in strict compliance with the requirements of Chapter 20 of the International Mechanical Code.
- B. Kitchen hood duct shall be 16-gauge steel or .044" thick stainless steel with liquid-tight welded or brazed construction and shall be sloped to grease drains.
- C. Duct access doors shall be provided as required for maintenance and proper grease removal, and shall be similar in construction to Buensode Type S-2, sized as large as possible, but in no case smaller than 18 inches by 12 inches.

## 2.18 GREASE DUCT INSULATION WRAP

- A. See Section 220700.

## 2.19 KITCHEN CONDENSATION HOOD DUCTS

- A. Furnish and install the exhaust ductwork for the kitchen condensation hood as shown on the drawings.
- B. Hood exhaust ductwork shall be of the same material and gauges as for standard ductwork. Ductwork shall be welded air and watertight.

- C. Duct access doors shall be similar in construction to Buensode Type S-2, sized as large as possible, but in no case smaller than 18 inches by 12 inches.

## 2.20 DUCTWORK

- A. All ductwork shall be fabricated and installed in compliance with the latest SMACNA duct manuals.
- B. Sheet metal ducts shall be properly braced and reinforced with and, where they protrude above roof, they shall be properly flashed.

## 2.21 DUCT JOINTS

- A. All duct joints must be sealed airtight as required by Table 1-2 "SEAL CLASSIFICATION" of the "HVAC Duct Construction Manual". The term "seal" or "sealed" means use of mastic or mastic plus tape or gasketing as appropriate.

## 2.22 DIMENSIONS

- A. Ducts, unless otherwise approved, shall conform accurately to the dimensions indicated on the drawings, and shall be straight and smooth on the inside with joints neatly finished. All duct sizes shown on the drawings are free area inside dimensions. Acoustically-lined ducts shall have outside dimensions increased as required to accommodate the acoustic lining specified and still maintain the free area inside dimensions shown on the drawings.
- B. Under no circumstances shall the cross section of any duct be decreased by dents, pipes, or hanger rods running through it unless otherwise indicated on the drawings. Neither shall the shape be changed without approval. No abrupt transitions that restrict the area shall be used. Where necessary to gain clearance, the duct seams may be turned inside. Structural and Architectural drawings shall be consulted for areas with restrictive clearances.

## 2.23 FIELD VERIFICATION

- A. No ductwork shall be fabricated without first field verifying that the available space (under actual job conditions) will permit installation of the ductwork without structural or other conflicts.

## 2.24 FLEXIBLE CONNECTION

- A. This contractor shall provide flexible connections not less than 4 inches wide, constructed of heavy, waterproof, woven plastic-coated glass fabric at the inlet and outlet connections of each fan unit, securely fastened to the unit and to the ductwork by a galvanized iron band, and provided with tightening screws. Corners shall be sewn tight shut.

## 2.25 +4" PRESSURE CLASS FLEXIBLE CONNECTIONS

- A. This flexible connection between the +4" P.C. ductwork and VAV boxes or fans shall be fabricated of neoprene-coated 1/8-inch glass fabric sheets with the ends vulcanized together. The flexible connection shall be securely attached to the fan and ductwork with heavy iron draw bands. Connections shall be 30-ounce Ventglass.

## 2.26 AIR FLOW MEASURING DEVICES

- A. The sheet metal contractor shall install the air flow measuring devices as specified in Section 251000. The devices will be furnished by the control contractor.

## 2.27 BELT GUARDS

- A. Belt guards shall be fabricated and installed. Guards shall be constructed of 10-gauge wire, 1-inch mesh in 1-1/2-inch angle-iron welded frames. All guards shall be provided with an opening for a tachometer and shall be either the split type or easily removable for belt repair. The guards shall be anchored securely to the floor or walls to prevent any vibration.

## 2.28 PRE-MANUFACTURED DUCTS

- A. Runouts above ceiling from primary supply air ducts to VAV terminal boxes may be rigid conduit or pre-manufactured high-pressure flex duct or a combination of the two.
- B. Runouts above ceiling from the terminal boxes to the ceiling diffusers shall be similar to "Genflex - Type IL". Maximum allowance length is 5'-0" in any given duct run. Duct to be factory fabricated with spring steel wire helix and 1" thick glass fiber insulation covered with external vapor barrier and lined with continuous non-perforated inner sleeve.
- C. Material shall comply with IMC Standard 10-1.

## 2.29 RECTANGULAR DUCT LINING

- A. The interior surface of all rectangular supply, return, fresh, relief, and exhaust air ducts (except where noted otherwise), shall be lined with 1" thick fiberglass dual density duct liner, having an average "K" factor of .24 BTU at 75 deg. F mean. The liner shall meet standards NFPA No. 90A and No. 90B and shall have the Underwriters' Laboratories, Inc., label.
- B. Duct liner shall be applied to the flat sheet with a 100% coverage of duct adhesive. The duct liner shall be cut to assure snug corner joints. The black surface of the liner shall face the air stream. On horizontal runs, tops of ducts over 12" in width and sides over 16" in height shall be additionally secured with welded pins and speed clips on a maximum of 15" centers. On vertical runs, gripnails or welded pins and speed clips shall be spaced on a maximum of 15" centers on all width dimensions over 12". Pins shall start within 2" of all cross joints within the duct section.
- C. Welded pins shall be cut virtually flush with the liner surface. Clips should be drawn down flush only and not so as to compress the liner and cause the leading edge of raise. All exposed edges and the leading edge of all cross joints of the liner shall be coated with adhesive.
- D. Material shall comply with IMC Standard 10-1.

## 2.30 BOILER STACKS & BREECHINGS

- A. Stack shall be double wall insulated positive pressure type as shown on plans, with necessary wall brackets, tee sections, cleanout doors, section bands, trim and fittings for a complete installation. Stack shall have 1" insulation, stainless steel liner and aluminized steel shell coated for field painting by the painting contractor. Stack shall be Metalbestos Model PS (UL listed).

## 2.31 GAS VENTS

- A. Flues for gas-fired equipment shall be of the sizes shown on the drawings. Flues shall be insulated double wall with stainless steel liner. Gas vent approved for continuous flue temperatures up to 1000 deg. F. Units shall be Metalbestos, Metalvent, or Dura-Vent.

- B. Top flues with Metalbestos Type "S-CT" vent cap especially designed for non-backdraft application. Flash and counter flash around flue at point of roof penetration to make watertight. Vertical and horizontal flues shall be double wall stainless steel construction.
- C. Flue which serves boiler must be a positive pressure type. All flues must be of type approved by Local Gas Company for application.

## 2.32 REGISTERS, GRILLES AND DIFFUSERS

- A. All registers, grilles, and diffusers located in locker/shower area shall be all aluminum construction.
- B. Supply Air Registers & Linear Diffusers:
  - 1. Furnish and install all supply air registers and linear diffusers shown and specified on the drawings. All units to have opposed blade balancing dampers. Registers and diffusers to have 4-way air deflection. All register cores shall be removable, or plaster frames shall be furnished with units. Registers shall be of steel, or anodized aluminum construction. Finish shall be bright white unless otherwise noted.
  - 2. Units shall be Krueger, Carnes, Metalaire, Nailor, or Price.
- C. Return, Exhaust & Transfer Air Registers:
  - 1. Furnish and install all ceiling and sidewall return, exhaust, and transfer air registers shown and specified on the drawings. All units to be painted steel, or aluminum construction (where permitted by fire code) with bright white finish and opposed blade balancing dampers. All cores shall be removable, or plaster frames shall be furnished with units. Registers located near the floor shall be heavy duty gymnasium type.
  - 2. Registers shall be Krueger, Metalaire, Titus, Nailor, Price or approved equal.
- D. Ceiling Diffusers:
  - 1. All ceiling diffusers shall be of the round, square, or rectangular type with louvered face and 1, 2, 3, or 4-way air pattern as indicated on the drawings. Units shall be painted steel, or aluminum construction (where permitted by fire code) with bright white finish and inner assembly shall be easily removable from outer frame without special tools. Louvers shall be spaced on 1-1/2" centers maximum.
  - 2. All diffusers shall be furnished with round or square opposed blade volume control and air extractor.
  - 3. Diffusers shall be Krueger, Titus, Price, Metalaire, Nailor, or approved equal.
- E. Thermal Displacement Diffusers:
  - 1. General: Except as otherwise indicated, provide manufacturer's standard thermal displacement diffusers where shown; of size, shape, capacity, and type indicated; constructed of materials and components as indicated, and as required for complete installation.

2. Performance: Provide thermal displacement diffusers that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device and listed in manufacturer's current data.
  3. Types: Provide thermal displacement diffusers of type, capacity, and with accessories and finishes as listed on register and grille schedule.
    - a. Finishes shall be epoxy, or powder coated painted steel unless notes otherwise. Custom Color as selected by the Architect.
    - b. Unit to have volume control damper, fixed flow equalizer, flow adjuster, and T.A.B. measurement port. Unless otherwise noted.
    - c. Diffusers shall be Krueger, Price, Metalaire, Nailor, or approved equal.
- F. Performance: Rate diffusers, according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."
- G. General:
1. All registers, grilles, and diffusers located in locker/shower area shall be all aluminum construction.
  2. Color and finish of all grilles, registers, and diffusers shall match ceiling grid. Coordinate with the Owner's representative.

## 2.33 LOUVERS

- A. At all air system openings in outside wall, install storm louvers.
- B. Construct louvers of anodized aluminum.
- C. Slats shall be inclined at least 45 degrees from the horizontal and overlap a minimum of 1". Slats over 40" long shall have a 2" wide intermediate support. The exterior face of the louver shall be neatly fitted to the building wall, flashed at top, and caulked at sides and bottom. New open area for air passage shall be at least 50% of the nominal size. On the inside face of the louver, install a removable screen, consisting of 1/2" mesh galvanized wire screen in a galvanized channel frame. The louver shall have a sub-frame and shall be removable. See plans for custom louvers required.
- D. Caulk around louver frames with clear G.E. silicone sealer after installation. Caulk color shall match color of surrounding material.
- E. Provide recessed frame.
- F. Louvers to be provided with factory finish, Color to be determined by architect.
- G. Louvers shall be Airolite, Air Balance, Air Guide, Ruskin, or Dowco.

## 2.34 ROOFTOP AIR CONDITIONING UNITS

- A. Furnish and install complete the roof-mounted packaged type DX cooling unit, as shown and specified on the plans. Unit to be factory-wired and tested and of capacities as listed. the unit shall be shipped completely assembled, pre-charged, piped, and wired internally, ready for field connections. In addition, the manufacturer shall provide field start-up and test for each unit and shall forward a copy of the start-up report to the Architect.
- B. The unit shall be complete with integrated economizer capable of simultaneous economizer and compressor operation. Economizer shall include all hardware and controls for cooling with outside air, low leakage dampers not to exceed 3% leakage at 1.0 in. wg pressure differential, capable of introducing up to 100% outside air and equipped with gravity relief air damper. Provide 0-10 VAC control points as required for ATC contractor.
- C. Rooftop unit to come complete with a factory terminal strip for connection by ATC contractor.
- D. Roof curb shall be of steel construction and shall extend 12" minimum above the finished roof surface. The mounting shall made to the bottom perimeter of equipment and distribute the unit weight uniformly to the structure.
- E. High- and low-pressure switches shall be factory-installed and wired. These switches shall protect the system against abnormal operating conditions. Low pressure switch shall be automatically reset, high pressure switch shall be manual reset.
- F. The unit shall be furnished complete with a field installed starting kit to aid the compressor when the compressor is starting under a condition of low voltage.
- G. All components, wiring, and inspection areas shall be completely accessible thru removable panels which have locking door handles.
- H. Provide factory hail guards.
- I. Provide a factory mounted weather-proof 120-volt GFI outlet.
- J. The compressor section shall carry a full 5-year parts and labor guarantee.
- K. Units shall be Trane, Carrier, Lennox or approved equal.

## 2.35 MAKEUP AIR UNIT

- A. Furnish and install, where shown on plans, make-up air heating, cooling, and ventilating package unit. Unit shall be approved by American Gas Association for outdoor installation.
- B. Blower wheels and all cabinet parts shall be fabricated from hot dipped galvanized steel. Cabinets shall have additional weather resistant alkyd wrinkle enamel coating.
- C. Cooling section shall consist of high efficiency evaporative cooling filter pads with adjustable water distribution trough for leveling. Water supply shall be by means of heavy-duty circulating pump with copper distributor tubes.
- D. Heating elements shall be stainless steel with burner and controls assembly removable as a unit for service. Burners shall be readily accessible for cleaning and service without disassembly of cabinet or ductwork.

- E. Gas controls shall provide modulating gas fire, with momentary high fire start. Electrical controls shall include a wall-mounted control panel with pushbutton actuated switches and individual indicator lights, duct-mounted, two-stage thermostat, and motor contactor, as required. Coordinate with Division 25 contractor.
- F. Control panel shall provide choice of heating, ventilating, or cooling function. Unit shall have all internal wiring, including motor and motor controls, factory wired and pre-tested.
- G. Each unit shall be shipped completely assembled in a single packaged unit and shall be factory fire tested before shipment.
- H. All parts shall carry minimum manufacturer guarantee as follows:
  - 1. 100% hot dipped galvanized cabinet and blower wheel: 5 yrs.
  - 2. Stainless steel heating element: 5 yrs.
  - 3. Water recirculating pump: 2 yrs.
- I. Unit shall be furnished with factory curb, intake hood with birdscreen, magnetic starter containing all necessary auxiliary contacts for interlocking the make-up air units with the exhaust fans. Coordinate with Division 25 contractor.
- J. Units shall be Trane, Econ-Air, Captive Air, Modine or approved equal.

#### 2.36 UNIT HEATERS (Gas Fired) (GUH-1)

- A. Furnish and install in the locations shown on the plans the sealed combustion gas-fired unit heater shown and specified. Each unit to have capacity, air delivery, fan type, and motor characteristics as shown on the plans.
- B. Heat exchangers shall be either open or sealed type as shown on drawings and shall be aluminized steel designed to accommodate thermal stresses without internal damage. Burners shall be AGA approved with 24-volt control circuit and automatic safety pilot.
- C. Unit casings shall be of not less than 16-gauge steel. All casings to be phosphatized for rust resistance and finished with a baked enamel. All hardware shall be plated for rust resistance.
- D. Motors and fans shall be designed for unit heater service and shall be tested for continuous duty as applied on each size to eliminate vibration and minimize sound.
- E. Horizontal delivery units shall be equipped with formed louvers, 4-way individually adjustable.
- F. Units shall be furnished with 2-stage room thermostat (fan only and fan & heat) and all controls for automatic operation.
- G. Provide factory vent and intake kit.
- H. Unit heaters shall be Reznor, Hastings, Modine or Lennox.

#### 2.37 UNIT HEATERS (Electric)

- A. Furnish and install in the locations shown on the plans the electric unit heater shown and specified. Each unit to have capacity, air delivery, fan type, and motor characteristics as shown on the plans.

- B. Unit casings shall be of not less than 16-gauge steel. All casings to be phosphatized for rust resistance and finished with a baked enamel. All hardware shall be plated for rust resistance.
- C. Motors and fans shall be designed for unit heater service and shall be tested for continuous duty as applied on each size to eliminate vibration and minimize sound.
- D. Horizontal delivery units shall be equipped with formed louvers, 4-way individually adjustable.
- E. Units shall be furnished with factory disconnect, 2-stage room thermostat (fan only and fan & heat) and all controls for automatic operation.
- F. Unit heaters shall be Markel, Chromalox, Raywall, Intertek or approved equal.

#### 2.38 PACKAGED AIR CONDITIONER

- A. Furnish and install complete the air-to-air split system packaged air conditioner shown and specified on the drawings.
- B. Evaporator section shall be ceiling mounted type with pre-charged refrigerant system, packaged controls, swing flow outlet air louvers, and packaged, integral, concealed drain pump. Unit shall be complete with filter section, hard wired, wall mounted thermostat, and all controls for automatic operation.
- C. Condensing unit section shall be complete with high performance hermetic compressor with high- and low-pressure safety controls, air cooled condenser with modulating fan controls for operation at outdoor air temperatures as cold as 0 deg. F.
- D. Unit shall be Mitsubishi, Lennox, LG, or approved equal.

#### 2.39 PACKAGED HEAT PUMP UNITS

- A. Furnish and install complete the air-to-air split system packaged air conditioner shown and specified on the drawings.
- B. Evaporator section shall be ceiling mounted type with pre-charged refrigerant system, packaged controls, swing flow outlet air louvers, and packaged, integral, concealed drain pump. Unit shall be complete with filter section, hard wired, wall mounted thermostat, and all controls for automatic operation.
- C. Condensing unit section shall be complete with high performance hermetic compressor with high and low pressure safety controls, air cooled condenser with modulating fan controls for operation at outdoor air temperatures as cold as 0 deg. F. Provide hard wired, wall mounted heating/cooling thermostat, auto changeover and all controls for automatic operation.
- D. Heating section shall be electric
- E. Unit shall be Mitsubishi, Lennox, LG, or approved equal.

#### 2.40 AIR COOLED CONDENSING UNIT

- A. Outdoor-mounted, air-cooled dual circuit condensing unit with Puron® refrigerant (R-410A) suitable for on rooftop installation.



- B. The unit shall have two independent refrigeration circuits and shall consist of multiple scroll or screw compressors.
- C. Unit shall have air-cooled coils, propeller- type low sound condenser fans, control box, and shall discharge condenser air vertically upward as shown on certified drawings.
- D. Unit shall be used in refrigeration circuit with a custom air-handling unit direct-expansion coil.
- E. Provide seismic spring isolators for roof mounting.
- F. Unit performance shall be rated in accordance with ARI Standard 365, latest edition (U.S.A).
- G. Unit construction shall comply with latest edition of ASHRAE 15 Safety Code, UL 1995, and ASME applicable codes (U.S.A. codes).
- H. Unit shall be manufactured in a facility registered to ISO 9001:2000 Manufacturing Quality standard.
- I. Base unit shall be constructed in accordance with UL standards and CSA.
- J. Unit cabinet shall be capable of withstanding 500-hour salt-spray exposure per ASTM B117
- K. Design pressure shall be 650 psig (4482 kPa).
- L. Unit shall be functional checked at the factory.
- M. Factory assembled, single-piece, air-cooled condensing unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, compressors, nitrogen holding charge, and special features required prior to field start-up.
- N. Unit Cabinet:
  - 1. Cabinet shall be galvanized steel casing with a baked enamel powder or pre-painted finish.
  - 2. Cabinet shall be capable of withstanding 500-hr salt spray test in accordance with ASTM (U.S.A.) B-117 standard.
  - 3. Control box access panels shall be hinged for service access.
  - 4. Lifting holes shall be provided to facilitate rigging.
- O. Fans:
  - 1. Condenser fans shall be direct-drive, low sound, propeller type, discharging air vertically upward.
  - 2. All condenser fan motors shall be totally enclosed 3-phase type with permanently lubricated ball bearings, class F insulation and internal, automatic-reset thermal overload protection or manual reset calibrated circuit breakers.
  - 3. Shafts shall have inherent corrosion resistance.
  - 4. Fan blades shall be statically and dynamically balanced.
  - 5. Condenser-fan openings shall be equipped with PVC-coated steel wire safety guards, or factory louver package.
- P. Compressors:
  - 1. Compressors shall be scroll type, or equal of rotary screw.
  - 2. Operating oil charge and a crankcase heater control oil dilution.
  - 3. Compressors shall be mounted on two rails having rubber in shear vibration isolators.

4. Staging of compressors shall provide unloading capability. Digital compressor unloading control shall be available as an option on one circuit.
5. Compressor motors shall be cooled by refrigerant gas passing through motor windings and shall have either internal line break thermal and current overload protection or external current overload modules with compressor temperature sensors.

Q. Condenser Coils:

1. Coil shall be air-cooled heat exchanger, and shall have a series of flat tubes containing a series of multiple, parallel flow coils layered between the refrigerant manifolds. Coils shall consist of a two-pass arrangement. Coil construction shall consist of aluminum alloys for the fins, tubes and manifolds in combination with a corrosion-resistant coating on the tubes.

R. Tubes shall be cleaned, dehydrated, and sealed.

S. Assembled condenser coils shall be leak tested and pressure tested at 650 psig (4482 kPa).

T. Refrigeration Components:

1. Refrigeration circuit components shall include liquid line temperature relief device, pressure transducers, liquid line shutoff valve, suction shutoff valve, suction line accumulators, nitrogen holding charge, and compressor oil.
2. Long line length check valves are required for liquid line installation on all linear line length applications of more than 100 ft (30.5 m) to prevent liquid migration during unit shutdown. For any 025-030 size dual circuit unit application where evaporator is located higher than the condensing unit, check valves are required for linear line length above 55 ft (16.8 m).
3. Units shall include one factory-installed suction line accumulator for each refrigerant circuit.

U. Controls and Safeties:

1. Unit controls shall include:
  - a. scrolling marquee display.
  - b. Unit control with standard pressure transducer, discharge pressure transducer and suction temperature thermistors.
  - c. Current alarm list and alarm history list on display.
  - d. Automatic compressor lead/lag control.
  - e. Service run test capability.
  - f. Compressor minimum run time (3 minutes) and minimum off time (3 minutes).
  - g. Service diagnostic mode.
  - h. Self-contained low voltage control circuit.
  - i. Cycle condenser fans to maintain proper head pressure control.
  - j. Capacity control with staging compressors.
  - k. Optional digital scrolls to stage compressors and cycle digital compressor for maintaining desired leaving air temperature set point.
  - l. Alarm relay output to indicate when unit is in alarm condition.

V. Minimum safety devices shall include:

1. Solid-state compressor lockout to provide optional reset capability at the space thermostat if any of the following safety devices trip and shut off compressor.
  - a. Compressor lockout protection for internal or external overload.
  - b. Low pressure protection.
  - c. High pressure protection (high pressure switch or internal).
  - d. Compressor reverse rotation protection.
  - e. Loss of charge protection.
  - f. Low suction superheat protection.

W. Electrical Requirements:

1. All unit power wiring shall enter unit cabinet at a single location and provide a single point connection.

2. Special Features:

a. Low Ambient Control:

- 1) Control shall regulate fan motor speed in response to the saturated condensing temperature of the unit. The control shall be capable of operating with outdoor temperatures at 20 F (28.9 C).
- 2) Low ambient control shall be available as a factory-installed option for all units.

3. Sound Reduction:

- a. Provide low sound fan for sound reduction.
- b. Provide compressor sound blankets for sound reduction.

4. Digital Compressor:

- a. Modification shall include digital compressor to provide incremental steps for tighter temperature control.

5. Non-Fused Disconnect:

- a. A non-fused disconnect shall be factory installed.

6. Long Line Length Check Valves:

- a. Long line length check valves shall be factory installed.

7. Energy Management Module (EMM):

- a. The EMM shall provide remote set point, demand limit control, and percent capacity input.

X. Unit shall be shipped as single package and shall be stored and handled per unit manufacturer's recommendations.

- Y. Entire unit shall carry a 5-year parts and labor warranty. The compressors shall carry a 10-year parts and labor warranty.
- Z. Manufacturer: Packaged condensing unit shall be York, Carrier, Trane or approved equal.

#### 2.41 INSTALLATION OF CONDENSING UNIT

- A. General: Install condensing unit in accordance with manufacturer's installation instructions. Install unit plumb and level, in locations indicated, and maintain manufacturer's recommended clearances.
- B. Support: Install roof mounted units on seismic spring isolators on support rails anchored to stay there.
- C. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory mounted. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 16.
- D. Control: Coordinate field installed automatic temperature control requirements with other sections of Division 251000.
- E. Manufacturer's Supervision: Condensing unit manufacturer shall supervise field assembly (if any) and installation of work, with factory trained technical service representative, for minimum of 2 working days. Prepare manufacturer's written report of installation, signed by representative.
  - 1. Include leak testing, evacuation, dehydration, vacuum pumping, and charging in scope of supervision by manufacturer's representative.
  - 2. Include lubrication, including filling of reservoirs, and confirming that lubricant is of quantity and type recommended by manufacturer in scope of supervision by manufacturer's representative.
  - 3. Paint damaged and abraded factory finish with touch-up paint matching factory finish.
  - 4. Grounding: Provide positive electrical equipment ground for condensing unit equipment and components where indicated.
- F. Copies of the written report of installation shall be included in each copy of the O&M Manuals.
- G. Start Up: Start-up condensing unit, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative.
  - 1. Test controls and demonstrate compliance with requirements.
  - 2. Replace damaged or malfunctioning controls and equipment.
  - 3. Furnish sufficient refrigerant and dry nitrogen for pressure testing under manufacturer's supervision.
- H. Field tests during condensing unit installation and start-up tests shall not be considered as fulfilling requirements of commissioning tests.

## 2.42 EXHAUST FANS

### A. Roof-Mounted Type:

1. Furnish and install complete the low-profile roof-mounted exhaust fans of the size and capacity shown on the drawings.
2. Roof-mounted fans shall be of the centrifugal type with spun aluminum hood. All parts exposed to weather and all fastenings shall be either aluminum or stainless steel. All fans to be equipped with permanently lubricated two-speed (where specified) ball bearing motors located in separate compartment out of the air stream. Fan shall have adjustable V-belt drive, self-flashing insulated curb, backdraft dampers, bird screen, disconnect switch, and shall be complete with all necessary fittings and transition pieces for a complete installation. All units shall bear the AMCA certified performance seal.
3. Fans shall be Twin City, Loren or Penn.

### B. Propeller Type:

1. Furnish and install complete the propeller ventilation fan shown and specified on the drawings.
2. Fan shall be direct-connection, two-speed, motor-driven type. Wheels shall have steel or aluminum blades with heavy nubs. Mounting rings or plates shall be cast or die-formed to smooth curves where the air enters the wheel. Mounting plates shall prevent distortion and shall be turned up at all edges or braced with steel angles. A wire mesh guard shall be provided on fan. Unit shall bear AMCA Certified Performance Seal.
3. Fan shall be Twin City, Penn or Loren.

### C. Ceiling Type:

1. Furnish and install complete the ceiling-mounted exhaust fans shown and specified on the drawings.
2. Fan shall have acoustically insulated housing for quiet operation. Air deliveries shall be as indicated on the drawings and shall be certified by AMCA performance tests.
3. Fan shall have centrifugal wheel direct connected to motor. Ceiling grille shall be all aluminum construction with satin finish. Entire fan, motor, and wheel assembly shall be removable without disturbing the housing. Fan speeds shall not exceed 1100 RPM. Unit shall be complete with backdraft damper.
4. Fan shall be Twin City, Loren or Penn.

## 2.43 ROOF PENTHOUSES

- A. Furnish and install complete the louvered type roof penthouses as shown on plans and specified in the Equipment Schedule. All units shall be of aluminum construction capable of withstanding 100 MPH winds. Unit to be complete with bird screen, self-flashing roof curb with wood nailer, and all accessories required for a complete installation. Hoods shall be high wind rated construction.
- B. Roof penthouses shall be Greenheck, Loren Cook, Penn or approved equal.

#### 2.44 ROOF HOODS

- A. Furnish and install complete the roof hoods as shown on plans and specified in the Equipment Schedule. All units shall be of aluminum construction, complete with bird screen, self-flashing roof curb with wood nailer, and all accessories required for a complete installation.
- B. Roof hoods shall be Greenheck, Loren Cook, Twin City, or approved equal.

#### 2.45 SOUND TRAPS

- A. Furnish and install complete the sound traps shown and specified on the plans. Sound traps shall be either round or rectangular, as noted on the plans. Sound traps shall have 22-gauge minimum galvanized steel sheets. Interior configuration shall incorporate straight thru passages of consistently exact dimensions to insure uniform performance.
- B. Sound trap ratings shall be the results of dynamic insertion loss tests by an independent laboratory.
- C. The sound trap manufacturer shall supply, with the submittal drawings, copies of the independent laboratory test data on dynamic insertion loss, air flow generated noise, and air flow performance.
- D. Sound traps shall be: Vibro-Acoustics, Silence, Inc., or Industrial Acoustics.

#### 2.46 AIR FILTER BANKS

- A. Furnish and install the filtering bank systems shown and specified on the drawings. Filter banks shall be suitable for the space available. Filter banks shall be constructed and installed so as to prevent the passage of unfiltered air. Felt, rubber, or neoprene gaskets shall be provided between filter frames and unit casing, etc. Steel filter parts shall be protected against corrosion.
- B. Filter bank shall consist of 35% efficient (ASHRAE 52-76 test standard) replaceable media type air filters. The supporting front grid of each filter section shall be hinged to facilitate easy replacement of filter media. Filter frames shall be of 18-gauge galvanized steel construction with 11-gauge galvanized steel wire grids to support the media.
- C. At the time of acceptance of the work, new filter media shall be furnished and installed by the contractor.
- D. Provide one complete set of spare filter media (in addition to the new filters installed at time of acceptance) for each filter bank and store on site as directed by the owner's representative.
- E. Air filter banks shall be Cambridge, AAF, or Farr.

#### 2.47 VARIABLE AIR VOLUME RE-HEAT BOXES:

- A. Casings shall be 26 gauge galvanized with flange rectangular discharge duct connection. A one-piece aluminum backdraft damper shall be provided on the fan discharge. The damper shall be factory set and aligned to insure a precise seal. Leakage rate shall not exceed 2 percent of rated capacity at 0.5" static pressure.
- B. Automatic damper operators and controllers shall be furnished by the ATC contractor and installed by the VAV box manufacturer. Boxes to be c/w paint tie-in for interface with room occupancy sensors. Provide sheet metal enclosure around damper operator/controller.

- C. The VAV box manufacturer shall furnish and install an approved cross flow sensor with a gain factor of not less than three (3).
- D. VAV boxes shall be provided with a pressure independent 3-position volume regulator which operates thru a thermostatically reset velocity controller to provide constant air delivery within plus or minus 5 percent of rated flow, and down to 25 percent of the VAV box rated CFM. Factory calibrated field adjustable setpoints shall be provided to set maximum and minimum CFM.
- E. The hot water heating coil shall be a single or multiple row unit as specified with plate-type aluminum fins and mechanically bonded to a copper tube carrier pipe.
- F. The entire unit shall be serviceable from a single ceiling access door.
- G. Units shall be Price, Krueger, Nailor or approved equal

2.48 CROSS FLOW PRESSURE SENSORS FOR VAV BOXES

- A. Sensors shall be aluminum corrosion resistant of the crossflow type with ported tubes and baffle mounted to a center manifold. The center manifold shall have 1/4" barb fittings for FRPE tubing and shall provide a differential pressure proportional to the average velocity of air moving through duct.
- B. The sensors shall have an amplification factor (gain) of at least three and flow coefficient as follows:

| Size | CV   |
|------|------|
| 4    | 209  |
| 5    | 315  |
| 6    | 462  |
| 7    | 612  |
| 8    | 817  |
| 10   | 1250 |
| 12   | 1792 |
| 14   | 2474 |
| 16   | 3235 |

2.49 AIR FILTERS

- A. Provide one complete set of spare filter media (in addition to the new filters installed at time of acceptance) for each unit filter bank and store on site as directed by Architect.
- B. Air filter banks shall be Cambridge, AAF, Flanders, or Eco-Air.

2.50 HVAC SMOKE DETECTORS

- A. All units above 2000 CFM shall be provided with smoke detectors located in the return air intake and supply air discharge as per IMC. Detectors to be provided and wired under Section 16000. ATC contractor to install all detectors.
- B. Duct smoke detectors shall not be installed until just prior to final inspection to prevent dust and debris from contaminating detector.

## 2.51 FUSIBLE LINK FIRE DAMPERS

- A. Furnish and install complete the fire dampers shown on the plans and specified herein. Dampers shall be provided and installed in accordance with NFPA-90A and bear the UL Label of Approval. Fire and ceiling radiation dampers shall be curtain-type with fusible link located in the air stream. Submit installation drawings.
- B. Spring catches shall hold the dampers in a closed position when F.L. is broken. The weight of the duct and mounting frames shall comply with the National Board of Fire Underwriters and approved installation drawings. Sleeves with angles are required at all locations.
- C. Provide hinged, gasketed, and latched access panels in duct at each damper. Stencil "Fire Damper" in 1" high red letters on white background at each access panel.
- D. Provide ceiling access panels approved by the Owner's representative at each duct access panel when required, for maintenance and inspection of the fusible link.
- E. Fire dampers shall be Air Balance, Ruskin, Pottorff, or Nailor.

## 2.52 DAMPERS - GENERAL

- A. Damper frames shall be of not less than 18-gauge galvanized steel, formed for extra strength, with mounting holes for enclosed duct mounting.
- B. All damper blades shall be of not less than 16-gauge galvanized steel formed for strength and high velocity performance. Blades on all dampers must be of not over 6" in width. Blades shall be secured to 1/2" diameter zinc-plated axles by zinc-plated bolts and nuts. All blade bearings shall be nylon. Blade side edges shall seal off against spring stainless steel seals. Teflon-coated thrust bearings shall be provided at each end of every blade to minimize torque requirements and insure smooth operation. All blades linkage hardware shall be constructed of corrosion-resistant, zinc-plated steel and brass.

## 2.53 AUTOMATIC DAMPERS

- A. The ATC contractor shall furnish all automatic control dampers. The sheet metal contractor shall install all dampers and transition all ductwork to the dampers.
- B. All dampers at rooftops and combustion air dampers at roof hoods shall be Tampco class 1 dampers. No substitutions.

## PART 3 – EXECUTION

### 3.1 JOB SITE CONDITIONS

- A. Inspection:
  - 1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
  - 2. Verify that the work of this section may be installed in accordance with all pertinent codes and regulations in the approved shop drawings.



B. Discrepancies:

1. In the event of discrepancy, immediately notify the Architect.
2. Do not proceed with installation in areas of discrepancy, until all such discrepancies have been fully resolved.

3.2 INSTALLATION OF EQUIPMENT

- A. Install all equipment with adequate space for service and maintenance. **Minimum of 24" clearance for all service and control access.**
- B. VAV boxes, fan coil units, and similar equipment which requires periodic service and maintenance shall be installed in plenum space within 2 ft. of finished ceilings, or within 2 ft. of the bottom chord of the structure.
- C. All visible surfaces behind grilles and registers shall be painted flat black.
- D. Care shall be taken to avoid interference with structure and the work of other trades. Do not cut into load carrying members without the approval of the Owner's representative.

3.3 INSTALLATION OF DUCTS

- A. All ducts shall be installed in compliance with the latest editions of the SMACNA manuals.
- B. All necessary allowance and provisions shall be made in the installation of sheet metal ducts for the structural conditions of the building, and ducts shall be transformed or divided as may be required. Whenever this is necessary, the required area shall be maintained. All changes, however, must be approved and installed as directed.
- C. Pre-manufactured ducts shall be connected to rigid ducts and equipment with solid wraps of fabric duct tape and tyton bands drawn tight to form an airtight joint.
- D. During the installation, the open ends of all ducts shall be protected by covering with plastic sheet tied in place to prevent debris and dirt from entering.
- E. Install this work in cooperation with other trades so that there will be no delay in the progress of construction work. It is extremely important that the duct system be clean before connections are made to the VAV boxes.
- F. The contractor shall take special care when running exposed ductwork to ensure that the final installation is neat in appearance.
- G. Spiral ducts running exposed in occupied areas shall be hung with an aircraft cable type hanger.
- H. Under no circumstances shall ductwork be supported from the metal roof deck. (See general requirements 230100)
- I. Ceiling outlets shall be rigidly supported from the overhead structure with G.I. wires or straps, or from rigid galvanized iron ductwork. Outlets shall not be supported from T-bar ceilings or metal roof deck.

J. Hanger and Supports:

1. Hangers for ducts up to 18" in width shall be placed on not more than 8'-0" centers. Ducts 19" and over in width shall be supported on not more than 4'-0" centers. Hangers shall be placed plumb and present a neat appearance. Construct hangers from galvanized band iron 1" x 1/8" for duct up to 36" wide. Hangers shall extend down the sides of the ducts not less than 9". On ducts less than 9" in depth, hangers shall extend the full depth of the ducts. Attach hangers to ducts using not less than three rivets or parker screws of appropriate sizes. It is essential that all ducts be rigidly supported. Where vertical ducts pass thru floors or roofs, supporting angles shall be rigidly attached to ducts and to the structure. Angles shall be galvanized and of sufficient size to support the ductwork rigidly. Place supporting angles on at least two sides of the duct. For round ducts, strap hangers shall extend completely around ducts.
2. Ceiling outlets shall be rigidly supported from the overhead structure with G.I. wires on straps, or from rigid galvanized iron ductwork. Outlets shall not be supported from T-bar ceilings unless approved by the owner's representative.

K. Ducts at Masonry:

1. Where ducts are shown connecting to masonry openings and along edges of all plenums at floors and walls, provide a continuous 2" x 2" x 3/8" galvanized angle iron which shall be bolted to the construction and made airtight to the same by applying caulking compound. Sheet metal at these locations shall be bolted to the angle irons.

L. Installation of Food Preparation Area Ducts:

1. Connections from ductwork to hoods shall be performed by this section.
2. Duct systems shall be so constructed and installed that grease and/ or moisture cannot become pocketed in any portion thereof, and the system shall slope not less than 1/4" per lineal foot towards the hood or toward an approved grease reservoir. Where horizontal ducts exceed 75 feet in length, the slope shall be not less than one inch per lineal foot. When a centrifugal fan is used, it shall be positioned so that the discharge outlet is in a bottom horizontal position and the air shall be so diverted that there will be no impingement on the roof, other equipment or parts of the structure.
3. Provide access panels in the ductwork from kitchen hood exhaust fans to allow internal inspection and cleaning of exhaust ductwork.
4. Locate not more than 12 feet 0 inches on centers, and at all elbows. Coordinate location of access panels with available maintenance access space.

### 3.4 STORAGE OF DUCTS

- A. Ductwork shall be stored in a protected area to prevent physical damage to the duct liner, and to ensure that the duct liner is not exposed to excessive heat or moisture which would deteriorate the air side surface.
- B. Ductwork which has been improperly stored and/or sustained physical damage will be rejected and shall be removed from the job site as directed by the Owner's representative.

### 3.5 CLEANING OF DUCTS

- A. Before ducts are insulated and before the ceiling is installed and final connections made to the terminal boxes, the fans shall be operated at full capacity to blow out any dirt and debris from ducts. If it is not practical to use the main supply blower for this cleaning, the ducts may be blown out in sections by a portable fan. After the ducts have been cleaned and initially pressure tested, the final connection shall be made to the terminal boxes.

### 3.6 TESTING OF DUCTS

- A. Testing of ducts shall be done under section 230501 – Testing. Section 233000 to coordinate as required.
- B. Supply, return, and exhaust ducts, plenums, and casings operating at duct pressures from +2" to -2" shall be tested and made substantially airtight at static pressure indicated for the system before covering with insulation or concealing in masonry. Substantially airtight shall be construed to mean a leakage rate less than 5% of the rated airflow.
- C. Supply air ducts operating at pressures above +2" shall be tested and made substantially airtight. Leakage shall be less than 1% of the rated air flow.
- D. Ducts including all flexible runouts shall be tested in accordance with SMACNA Duct Construction Standards.
- E. After the vertical duct risers or branch ducts have all been tested and tied into the mains, and after the central station air handling apparatus has been installed, the mains shall be tested in accordance with SMACNA Duct Construction Standards.

End of Section

**DIVISION 25 - INTEGRATED AUTOMATION**

Section 25 1000

Automatic Temperature Controls

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## SECTION 25 1000

### AUTOMATIC TEMPERATURE CONTROLS

#### PART 1 – GENERAL

##### 1.1 GENERAL CONDITIONS

- A. The General Conditions, Supplementary General Conditions, alternates and addenda, applicable drawings and the technical specifications, shall all apply to all work under this division.

##### 1.2 SCOPE OF WORK

- A. The scope of work shall include all labor, material, and equipment necessary to supply an automatic temperature control system for the facility. The Contractor under this heading shall furnish and install a complete direct digital control system as specified.
- B. Contractor shall provide at time of bid a statement of compliance including, but not limited to:
  - 1. Detailed points list.
  - 2. Any deviations from base specification with listed costs.
- C. Install a new complete, fully programmable, customized Direct Digital Control (DDC) system for control of the systems. This DDC control system shall be configured to operate over the district wide network.
- D. Provide the following:
  - 1. Master DDC Control Panel
  - 2. Local DDC Control Panels
  - 3. ATC Interface Panels
  - 4. Local Area Network Wiring & Setup
  - 5. Hot Water Heating System Control
  - 6. Heating Water System Pressure Differential Sensor
  - 7. IDEC Cooling Water System Control
  - 8. VAV Fan System Control
  - 9. Gymnasium Fan System Control
  - 10. Kitchen Makeup Unit Control
  - 11. Kitchen E.F. Control
  - 12. Cook Hood Heat Sensor
  - 13. Kitchen Gas Valve Control
  - 14. Glycol Feed wiring
  - 15. Room Temperature Control
  - 16. Freezer Alarm (High and Low)
  - 17. Cooler Alarm (High and Low)
  - 18. Fire Riser Room Alarm (Low)
  - 19. Domestic Water Flow - Provide as Required and Coordinate with Division 26.
  - 20. CO Sensors/Detectors
  - 21. Building Fire Alarm Interlocks
  - 22. Exhaust Fan Control
  - 23. Energy Reporting here in.
  - 24. Alarming as specified here in.
  - 25. 120 and 140-degree Domestic Hot Water Systems Control
  - 26. Data server room temperature alarms and required tie-ins
  - 27. Connectivity and Interface with all VFD's
  - 28. Interface with electrical energy metering points per 2021 IECC>

- 29. KW Metering
- 30. BTUH Metering
- 31. Chilled water demand load limiting
- 32. Other Scheduled Items

### 1.3 MANUFACTURES/INSTALLERS

#### A. Approved control systems & installers.

- 1. EcoStruxure provided and installed by Utah/Yamas Controls, SLC as an extension to the District wide system – **No Substitutions.**

### 1.4 SYSTEM DESCRIPTION

#### A. Heating water systems are to be freeze-protected by a glycol solution.

#### B. All heating valves shall be normally open. No exceptions.

#### C. DDC system shall be configured and connected to the district Ethernet/Network. System shall be accessible from any remote site through an Ethernet or internet connection. All functions, programs and control system parameters shall be accessible and fully functional through the district network. The ATC contractor shall supply and install all required hardware and software to permit full access to the DDC system at the new school as well as every same manufacture system throughout the district. All controllers shall be Native BACnet and freely programmable. Controllers with canned programming are not permitted.

#### D. The entire building automation system shall tie into Ogden School District Lan Network. The ATC contractor shall include all software and hardware to permit district wide network and complete intranet access to the DDC system. This includes graphic pages, per Ogden School District standards, monitoring, alarming, trending, programming, database modifications, setpoint changes, DDC programming. All aspects and elements of the DDC control system shall be available across the entire district network. The use of PC anywhere, or similar remote software, or lick portal packages is not acceptable.

#### E. The system shall be as indicated on the drawings and specified herein. Building HVAC systems and unitary heating devices shall be entirely controlled by the DDC system. System shall include local DDC controllers mounted at each fan system, VAV reheat box, boiler, cooling tower, evaporative section, indirect cooling coils, pump, etc. These local DDC controllers shall be interconnected by a 2-wire or 3-wire LAN (local area network) with a master/central DDC controller located in the Main boiler room as directed by owner. BTU usage shall be provided for each VAV box, displayed on the graphic page and alarm configured based on BTU usage above adjustable thresholds. The master/central DDC controller, in turn, shall communicate with both the existing school district host computer located in the district offices and a man-machine interface device located in the Main Custodian office. This interface device shall be a Pentium based computer as specified below. Device shall display on separate, bit-mapped color screens each fan system, VAV box, cabinet unit heater, fan-coil unit, central heating system and central cooling system. Each screen shall have available for display in the appropriate location each input and output point monitored or generated by the DDC system. All digital output points shall have override capability. All screens shall be password protected so that sensitive data cannot be easily corrupted by inexperienced operators while allowing complete access to trained maintenance personnel. All of the above screens, data and features shall also be available for monitoring and modification from the Host computer located in the District offices via Networking (Ethernet) connections.

- F. The latest technology DDC/Energy Management systems will be furnished and installed. As a standard, these systems will include graphics and data files for each building at the Ogden School District maintenance office.
- G. The DDC/Energy system will be capable of different access levels for the different control and engineering functions of the system. The Ogden City School District maintenance staff will have access at the highest level to allow for DDC program, graphic pages, and other changes and additions.
- H. The DDC/Energy Management system will have dynamic alarm display capability. If an alarm should occur at a remote location or system, that alarm shall generate a message on whatever screen happens to be on the current display. All alarms shall be logged on the system printer. The system will be capable of printing logs and trends. It will also be capable of displaying graphic trend information for all points. Reference the alarm requirement section for more details on the energy alarms and system alarms.
- I. The DDC/Energy Management system will have a graphic and/or text page for each major mechanical piece of equipment or system (I.E.: boilers, fans, etc.). From these pages, there will be "live" readouts of temperatures, pressures, RH levels, on/off status, valve and damper positions, outside air temperature, etc. It shall be possible from this screen to perform setpoint changes, equipment on/off overrides, implement "test" status and values, without additional screen or program manipulation. Functions such as equipment schedules and reset schedules shall be accessed from editing screens. All functions shall be protected with different levels and passwords.
- J. There will also be a floor plan(s) which will show the location of rooms, room sensors, etc., and will give a "live" display of the current condition of that location. Room temperatures will be adjustable from this graphic. Outside air temperature will also display on this graphic. Larger buildings will require more than one of these floor plan pages. No more than 40 points should be on any one page.
- K. All system and unitary controls shall be of the direct digital type (DDC). Self-tuning PID (Proportional, Integral, Derivative) control algorithms shall be applied where applicable on all applications. The control system shall be a networked, distributed intelligence system, with the control loops for each system being capable of stand-alone operation.
- L. The system shall include all control devices, valves and damper parts as called for hereinafter.
- M. Division 26 contractor is required to supply and install a 3/4" EMT conduit system for the DDC control system at all areas except for the ceiling plenum. 3/4" EMT conduit shall be installed at all wall areas, hard ceiling areas, exposed ceiling areas, mechanical rooms and mezzanine fan room. Division 25 contractor shall provide bidding information to all Division 26 contractors for bidding purposes. See specifications section 260110 – Conduit Raceways.
- N. Plenum rated wire with permanent label shall be installed above areas with lay-in ceilings by Division 25.
  - 1. Plenum rated cable may be used in lieu of conduit above drop-in ceilings.
  - 2. Cables shall be run neat and straight, above ceiling without sagging.
  - 3. Cables shall not rest on or be supported by the ceiling.
  - 4. Cables shall be grouped according to system. Grouped cables shall be Velcroed together, **zip ties shall not be allowed.**
  - 5. Velcro straps shall be tagged with the various system and identified on 20-foot centers.
  - 6. Cables shall not receive excessive force when being installed.



7. Cables that have been damaged during installation shall be replaced at the contractors' expense. The contractor shall verify that all connections are in proper working order, terminated correctly and provide documentation to engineer prior to final walk through.
8. All cables being run (not in conduit) shall, as a minimum standard, be listed and appropriately labeled as being resistant to the spread of smoke and fire in accordance with applicable article of NFPA-70 (NEC).

O. Wireless devices or systems **WILL NOT** be accepted.

#### 1.5 WORK TO BE PERFORMED BY OTHERS

- A. Division 26 shall furnish and install all single phase and multiple phase electrical power wiring to magnetic starters, disconnect switches, VFD's and motors. Division 26 shall also provide 120 VAC, 20 Ampere power sources to each group of ATC panels and VAV boxes as shown. The ATC contractor shall be responsible for all step-down transformers and 24 VAC wiring to ATC equipment.
- B. Division 26 shall furnish all duct smoke detectors. Refer to Duct Detectors in this specification for the ATC contractor responsibilities.
- C. The sheet metal contractor shall install all dampers supplied by the ATC contractor. Each damper shall be installed so that it will operate freely and without binding. To ensure that the damper both opens and closes completely with less than 7#/sq. ft. torque applied at the operating shaft, each damper shall be checked after its installation, but before the damper actuators are attached. Dampers not properly installed or meeting this torque requirement shall be replaced and/or reinstalled without additional cost to the ATC contractor or the Ogden School District.
- D. The mechanical contractor shall install all valves, immersion wells and pressure taps supplied to him by the ATC contractor.

#### 1.6 INSTALLATION BY AUTOMATIC TEMPERATURE CONTROL (ATC) CONTRACTOR

- A. The successful control contractor shall furnish and install all necessary electrical control wiring and conduit for the complete temperature control system, heating and ventilating equipment motor starting circuit controls and all electrical control interlocks for same, and for control wiring for miscellaneous HVAC equipment furnished by the Owner.
- B. The ATC contractor shall be a licensed Electrical Contractor in the State of Utah with full time Master, Journeyman and apprentice electricians. If the ATC subcontracts the installation, it shall be to a licensed Electrical Contractor in the State of Utah. Full-time Master, Journeyman and apprentice electricians shall be utilized for the installation.
- C. The ATC contractor shall furnish & install all necessary electrical control wiring and all temperature controls, heating and ventilating equipment motor starting circuit controls, all electrical control interlocks for same and for miscellaneous packaged equipment as defined within this specification. Full-time Master, Journeyman and apprentice electricians shall be utilized for the installation.
- D. All ATC rough-in boxes shall be identified with the letters "ATC" written across the inside of the box with permanent marker. In addition, each ATC cover plate shall be painted white with the letters "ATC" stenciled in black.

#### 1.7 QUALITY ASSURANCE

- A. Provide an unconditional TWO-YEAR parts and service warranty. This warranty shall commence at the time of substantial completion of the various portions of the system.

- B. All parts and material and their installation methods shall be in accordance with the manufacturer's recommendations and specifications. All parts and material shall be new.
- C. The Contractor or firm executing the work of this section shall have at least 10 years' experience in completing work of similar scope and nature to that specified.
- D. Emergency response by contractor shall be available 24 hrs/day 7 days/week 365 days/yr. Response time shall not be greater than 12 hours from time of call.

#### 1.8 SUBMITTAL AND TECHNICAL INFORMATION

- A. Submit digital shop drawings, including manufacturer's data for the following items to the mechanical engineer:
  - 1. Wiring and installation diagrams.
  - 2. ATC device specification sheets
  - 3. Point list
  - 4. Control flow diagrams, complete with all control schematics and sequences of operation.
  - 5. Documentation of all software and hardware. These manuals shall be complete with installation procedures as well as startup and programming instructions. They should also contain any testing or maintenance procedures required to operate system on a continuing basis.

#### 1.9 PROJECT COMPLETION REQUIREMENTS

- A. Upon completion of the project, the ATC contractor shall spend a minimum of **40 hours** with the Ogden School District maintenance personnel to adequately instruct them on the operation and maintenance of the system. These training sessions shall be scheduled at times convenient to the School District and shall be conducted at the project.
- B. One on one, live, local hands-on training will be provided.
- C. The ATC contractor shall provide as part of his contract the on-site services of a technician familiar with the system to assist the air & water balance contractor in completing his portion of the project. The technician shall be available for a minimum of an additional **40 hours** for this assistance.
- D. The ATC contractor shall provide as part of his contract the on-site services of a programmer familiar with the system for an additional **24 hours** which the Engineer and/or the School District may use as they see fit to fine-tune or add features to the system.
- E. At 6 months after the completion date of the project, the ATC contractor will provide **16 hours** of onsite training with the owner. This training is part of this scope of work and costs shall be inclusive. The hours can be allotted in separate training sessions as determined by the owner. One on one, live, local hands-on training will be provided.
- F. At the time of the 12-month warranty walk through the ATC contractor shall provide an additional 8 hours of training to be used as required by OSD School District.
- G. Provide a CD Rom of the project operating and maintenance instruction manuals for use during the training sessions. CD shall contain all system components and DDC system "As-Built" drawings.

- H. Operation & Maintenance Manuals: These manuals shall provide descriptions of maintenance procedures for all system components, including sensors and controlled devices. They shall cover inspection, periodic preventative maintenance, fault diagnosis, and repair or replacement of defective components. They shall include complete as-built ATC installation drawings with sequences of operation for all mechanical systems controlled by the ATC contractor. Provide a digital copy of all "As-Built" system drawings.

## PART 2 – EQUIPMENT

### 2.1 CONTROLLERS

- A. Schneider Electric EcoStruxure BACnet Controls with freely programmable controllers, including VAV controllers, shall be utilized as indicated and specified elsewhere in this specification. Proprietary control system communication protocols will not be accepted.
- B. All main level controller inputs shall have at least 12-bit A/D converters for input accuracy. Less resolution is unacceptable for main level controllers or any controllers using an air monitoring station or monitoring building pressure. All main level controller outputs shall have board mounted hand-off-auto switches for local output override capability.
- C. The contractor shall utilize and employ only the following controllers for any central plant systems and air handling units. A single controller shall be designated with all programming and I/O for each system. This will allow standalone equipment operation in the event of communications failure. Connection of multiple small controllers or combined operation with other programmable controllers on air handlers and central plant equipment is not permitted. All controllers shall be freely programmable; controllers with canned programming are not acceptable.
- D. The only Variable Air Volume box controllers allowed for VAV applications shall be freely programmable. No substitutions, no canned application programming will be accepted.
- E. Direct Digital Control Systems and Approved Installing Contractors:
  - 1. EcoStruxure as supplied and installed by UTAH YAMAS Controls Inc. Salt Lake City, Utah – No Substitutions.
- F. All controllers and devices shall be identified.

### 2.2 DDC INPUT DEVICES

- A. All DDC input devices shall provide industry standard signals and shall be compatible with the DDC controllers used.
- B. All temperature input devices shall have a rated accuracy of 1% or better.
- C. Temperature input devices for coils on rooftop units shall have averaging elements.
- D. All pressure input devices shall have a rated accuracy of 2% or better. Pressure transmitters shall be selected to match the application and shall not be damaged by pressures at five times the maximum measurable pressure.
- E. Miscellaneous input devices shall have accuracies as individually specified. All miscellaneous devices shall be specifically identified (with specifications) with submittals.

## 2.3 DDC OUTPUTS

- A. Modulating outputs shall be in accordance with industry standards and shall be compatible with the driven DDC devices.
- B. Outputs shall be 0-10 VAC/VOC or 0.5 sec - 5.0 sec. 4-20 MA.
- C. DDC digital outputs shall be either relay contact closures or Triacs rated for the application.

## 2.4 DUCT SMOKE DETECTORS

- A. Duct smoke detectors are to be furnished and wired by Division 26. Detectors shall be installed by the ATC contractor. Detectors will be provided for the return air inlet for all systems of 2000 CFM or greater.
- B. Detectors shall be wired to allow monitoring by the DDC system as well as the fire alarm system. Division 26 shall furnish & install a fire alarm/fan shutdown relay at each fan system. The ATC contractor shall wire between the alarm relay contacts and the fan system starter to lock out the supply fans when the building is in fire alarm.
- C. Shutdown relay shall be wired to allow monitoring by the DDC System.

## 2.5 AUTOMATIC VALVES

- A. ATC valve bodies 2" and smaller shall be screwed with union; larger valve bodies shall be flanged. Screwed valves shall be rated at 150 psi or greater and shall have brass bodies. Flanged valves shall be rated at 125 psi or greater for standard heating and cooling water, and have cast iron or steel bodies. All automatic valves shall be for DDC control application.
- B. All ATC valves, including all 3-way valves shall fail Normally Open (N.O.)
- C. All heating valves shall fail Normally Open (N.O.)
- D. Heating valves at VAV re-heat coils are not required to be spring return valves.
- E. All valves shall be disc/plug and seat or ball valve construction.
- F. Shut-off pressure ratings of each valve shall be as required by the application.
- G. Valves shall be Belimo or Honeywell, M640001, M7400 series. (No substitutions)

## 2.6 MOTORIZED ATC DAMPERS

- A. Motorized control dampers that are not supplied with the air handling units shall be furnished by the Automatic Temperature Control Contractor. Dampers shall be factory-built, low leakage units such as Ruskin CD-50 or approved equal. Blades shall be 6" maximum width, 6063-T5 extruded aluminum width, 1/2" axles, and Oilite or Cylcoloy bearings. No round shafts will be accepted.
- B. All blade-to-blade linkages shall be external and accessible. No linkage within the damper frame channel will be accepted.
- C. Frames shall be 5" x 1", 6063-T5 extruded aluminum hat channel design, 0.125" minimum thickness with corner braces to assure squareness.

- D. Dampers shall be low leakage type with compressible end seals and neoprene or extruded vinyl blade and jamb seals. Leakage shall not exceed 6.2 cfm/sq. ft. at 4" W.G. Dampers shall require less than 7#-in/sq. ft. torque at the operating shaft for proper operation.
- E. Outdoor & return air dampers shall be parallel blade with blade direction oriented to assist mixing of air streams with spring return to fail closed. Relief air and other volume control dampers shall be opposed blade.

## 2.7 DAMPER AND VALVE ACTUATORS

- A. Damper and valve actuators shall be of the gear-train type. All moving parts shall be permanently lubricated and not require addition or replacement of oil. Actuators in and indoor or weather protected environment shall meet NEMA II requirements. Actuators for exterior applications or in contact with moisture shall meet the NEMA 3R rainproof rating and shall have an ambient temperature operating rating of -40°F to 140°F, without the addition of extra equipment. NEMA II & NEMA III locations shall be coordinated with the project engineer.
- B. Damper and valve actuators shall accept the appropriate Ma, VDC or digital output signals provided by the DDC controllers.
- C. Damper actuators shall be mounted outside the air stream whenever possible and be of sufficient size to operate the connected damper. Mount damper actuator on firm baseplate.
- D. Damper actuators linked to outdoor air and relief air dampers shall close their attached dampers upon power failure or fan shutdown by means of a mechanical spring return.
- E. Actuator manufacturers shall be Belimo or Honeywell. No substitutions.

## 2.8 BUILDING STATIC PRESSURE CONTROL

- A. Building static pressure will be controlled by modulating open relief dampers which are located between the space and outside air. There will be a differential pressure control function which will compare inside static pressure with outside pressure and position the relief damper to maintain a .05-inch water column (adjustable) positive pressure inside with respect to outside. If building power should fail the relief damper will close (spring return). Sequencing the relief damper with the mixed air dampers will not be acceptable.

## 2.9 ROOM THERMOSTATS

- A. Wall-mounted space temperature thermostat in occupied spaces shall have touchscreen covers with display and user adjustment within as determined by OSD personnel. Set point range shall be adjustable by owner via building control system. Flat plate stainless steel plate sensors will not be accepted.
- B. Temperature sensors in gyms and cafeteria areas shall be located in return air path behind low return air grille.
- C. Thermostats shall be located on interior stud walls wherever possible.
- D. Standardized locations and mounting heights shall be predetermined with owner prior to rough-in.
  - 1. Mount all thermostats at 48" AFF.

## 2.10 ZONE TEMPERATURE SENSORS

- A. Fast response type wall mounted space temperature sensors shall be installed in wall boxes behind blank, plastic housing. Sensors shall be of a type approved by engineer and building owner. None shall be mounted on outside walls or pipe chase.
- B. Standardized locations and mounting heights shall be predetermined with owner prior to rough-in.
  - 1. Mount all wall sensors at 48" AFF.

## 2.11 AIR QUALITY TRANSMITTERS

- A. The CO2 sensor shall be Senva CT1D-A3D self-calibrating capability and local CO2 level indication. Output signal shall be 0-5 VDC or 0-10 VDC as required by the DDC system.

## 2.12 PRESSURE SENSORS

- A. All wet and dry pressure sensor transducers shall include a display indicating the pressure reading on the face of the transducer.

## 2.13 OUTSIDE AIR SENSOR

- A. The building shall use an outside air temperature reading as obtained from government operated web sites over an internet connection for accurately controlling mechanical equipment. The ATC contractor shall provide IP level devices, hardware and any software to permit the use of the outside air temperature from the government website. A backup sensor shall be installed at the building and shall be used whenever the internet outside air temperature reading is unavailable.
- B. All outdoor air sensors shall be installed on the north face of the building or equipment. No Exceptions.

## 2.14 HOST COMPUTERS & USER INTERFACE

- A. The ATC contractor will connect to the existing district user interface and provide individual user interfaces that are customized for each user type. If there is no existing district user interface, the ATC contractor shall supply and install the user interfaces as defined below and will include all software required to edit, create and modify the individual profiles. The user interface must be configured so the user type cannot see the parameters, menus, etc not included in the specific user interface as defined below. The ATC contractor shall provide the following user interface types for the Hillcrest Elementary School. User interfaces that do not adhere the following will not be accepted.

### 1. **USER INTERFACE FOR ALARM RESPONDER USERS.**

- a. Email and SMS Text notification of alarms.
- b. Workspace that contains a Work Area pointed to a Dedicated alarm window that only shows critical alarm information for the entire school district, a graphic pointed to the district summary graphic to the right. Alarms will include:
  - 1) Low Building Temperature (below 50°F at any time)
  - 2) Low Heating Water Temperature (below 90°F for 30 minutes when the heating system is enabled)

- 3) Freeze/Cooler Temperatures (High and Low alarm)
  - 4) CO2 high ppm alarm
- c. Email and SMS Text notification of alarms. Each Notification will include the following:
- 1) Notify on Alarm state and Reset State
  - 2) Building name in the Subject line.
  - 3) Alarm Text in the Text selection
  - 4) Monitored Value in the Text selection
  - 5) Timestamp in the Text selection
  - 6) Filtered by Categories - Temp Low Space, Temp Low Hot Water, High Freeze Cooler.
- d. Each alarm will contain a link to the main floor plan graphics page of the school that shows where the alarm originated from.
- e. Each alarm will contain a link with detailed information showing steps the alarm responder should take when responding to the alarm. A detailed step by step instruction for each alarm will be provided and configured by the ATC contractor upon approval of the steps by the District.

## **2. USER INTERFACE FOR CUSTODIANS.**

- a. Full web-based graphics that include unit layouts and floor plans maps of the school. All temperature, status, command and control points shall be displayed on the graphics.
- b. The system tree shall be hidden
- c. All other schools within the district shall be hidden and non-accessible at the Custodian level.
- d. Alarms view on the bottom showing all alarms within the system
- e. The Software Permissions shall allow the user to override points on graphics pages.
- f. A dedicated alarm window that only shows critical alarm information for the school, the alarm filter for each building will done by alarm priority.
  - 1) Custodian Interface Alarms will include:
    - a) Low Building Temperature (below 50°F at any time)
    - b) Low Heating Water Temperature (below 90°F for 30 minutes when the heating system is enabled)
    - c) Primary Pump Failures
    - d) Fan Failures
    - e) Boiler Flame Failure
    - f) Freeze/Cooler Temperatures (High and Low for each)
    - g) CO2 detectors
    - h) Domestic Water Flow

- g. An event notification will be created for the school that contains the correct filtered alarms. It will be up to the individual school as to whether or not the custodian and/or principal is notified. Each Notification will include the following:
  - 1) Notify on Alarm state and Reset State
  - 2) Building name in the Subject line.
  - 3) Alarm Text in the Text selection
  - 4) Monitored Value in the Text selection
  - 5) Timestamp in the Text selection
  - 6) Filtered by priority
  - 7) Filtered by Categories - Temp Low Space, Temp Low Hot Water, Failure Fan,
  - 8) Failure Pump, Temp High Freeze Cooler.
- h. Graphic page(s) that include the ability for the custodian to override the system occupancy by entering a duration in minutes of how long the system shall run. The initial setting will be not to exceed 180 minutes (3 hours). Custodians will **not** have access to time schedules.

### **3. USER INTERFACE FOR ENERGY USERS.**

- a. Energy and maintenance users will have access to all schools/buildings within the district. A summary page will provide basic information for each building, the information will include:
  - 1) Building Hw Supply Temp
  - 2) HW Pumps Status'
  - 3) Building Low Space Temp
  - 4) Energy Dashboard
- b. Full web-based graphics that include unit layouts and floor plans maps of the school. All temperature, status, command and control points shall be displayed on the graphics.
- c. Energy users will have access to all DDC logic pages throughout the district.
- d. Energy users will have access to equipment runtime information and will receive equipment runtime alarms in addition to all other categorized alarms. Runtime alarms will include:
  - 1) Any heating pump runs longer than 23 hours per day when the outside air temperature is above 35°F
  - 2) Any cooling pump runs longer than 13 hours per day
  - 3) Any fan runs longer than 13 hours per day
- e. Email and SMS Text notification of alarms. Each Notification will include the following:
  - 1) Notify on Alarm state and Reset State
  - 2) Building name in the Subject line.
  - 3) Alarm Text in the Text selection
  - 4) Monitored Value in the Text selection



- 5) Timestamp in the Text selection
  - 6) Filtered by Categories - Temp Low Space, Temp Low Hot Water, Failure Fan, Failure Pump, Temp High Freeze Cooler.
- f. Energy users will have access to the daily schedules for each building.
  - g. Energy users will have a Holiday Calendar that will provide a means for un-occupying the buildings no matter what the schedules or overrides are set to.
  - h. Energy users will have access to historical trend log data that is captured by the system.
  - i. Default logs will be setup to sample every 10 minutes and keep 5000 samples available for real time reporting.
  - j. Energy users will have access to web-based reporting for historical trend log data, this can be accessed independently of the ATC system software.

#### **4. USER INTERFACE FOR HVAC TECHNICIANS.**

- a. Full web-based graphics that include unit layouts and floor plans maps of the school. All temperature, status, command and control points shall be displayed on the graphics.
- b. The configuration will permit access to all graphic pages and all other buildings throughout the district. The permissions will be set up to allow the user to override points on graphics pages.

#### **5. USER INTERFACE FOR ADMINISTRATION USERS.**

- a. Full web-based graphics that include unit layouts and floor plans maps of the school. All temperature, status, command and control points shall be displayed on the graphics.
  - b. Email and SMS Text notification of alarms if requested.
- B. The School District facility management and control system includes an existing Centralized Host computer currently located at the District offices. If the control system provided for this project will not seamlessly connect to the existing centralized computer, the ATC contractor shall provide as specified to provide all programming, monitoring, alarming and configuration functions within this specification. Networking, lines, and software shall be furnished and installed by Division 25. Communication shall be completed to the OSD School District office by Division 25. This includes complete control system access from the District office in addition to complete control system access at the school.
  - C. The most current versions of all necessary controlling & monitoring software & graphic displays shall be installed on the District Centralized Host computer. Copies of all software disks, operation manuals, along with installation instruction shall be provided to owner.
  - D. All new software releases available within one year of the substantial completion date shall be provided to the owner and installed at no additional cost to the School District.

- E. The controlling software database shall be constructed by the ATC contractor to OSD School District requirements. The contractor shall consult with OSD School District to verify these requirements as a part of this contract. Contractor shall provide a fully operational DDC control system that may be monitored, controlled & modified from the District Centralized Host computer. All control schedules, algorithms, and control logic shall be in place within each DDC controller and stored as back-up copies on both Host computers hard disks which may be downloaded to individual DDC controllers as necessary. Documentation provided shall include block software flowchart showing the interconnection between each of the control algorithms and sequences. A hard copy paper printout of points for each device shall be provided. Digital copies shall be provided in O&M manual.
- F. The building shall be represented by complete graphical floor plans, with accurate locations of each major piece of HVAC equipment. A zoom feature shall allow the operator to select any of the main fan systems and see a graphical representation of the system with dynamic representation of all appropriate DDC input & output devices. Each major piece of HVAC equipment shall be graphically represented at each Host computer with all appropriate DDC points dynamically represented.

#### 2.15 MASTER DDC CONTROL PANEL:

- A. The master DDC control panel for the building shall be mounted in a lockable panel enclosure in the Main Custodian office or as directed by the owner. The ATC contractor shall furnish and install a Network/Ethernet connecting device via District supplied network lines to the District host computer.
- B. The master DDC control panel shall have the capability of overriding all HVAC unit control. Panel shall have override indicating light. Override shall be programmed for 4 hours (adjustable) and be interconnected to building DDC system.
- C. The master DDC controller shall have a minimum of (2) ports for connection to external devices. One port is to be connected to a Network/Ethernet connection, the other is to be connected directly to the local Host computer system.
- D. The master DDC controller shall be 16-bit microcomputer based, providing a multi-tasking operating system for control functions simultaneous with all other facility management, operator interface, and system communications functions.
- E. The master DDC controller shall provide true floating-point arithmetic calculations. To accommodate accumulation of large, totalized values, this controller shall support calculation and accumulation of values up to 10 to the thirty- eighth power.
- F. The master DDC controller shall provide to the Host computer diagnostic reports of the following types, for all DDC devices:
  - 1. Trend logs
  - 2. Energy reports, KW & BTUH
  - 3. Exception tables/by operator
  - 4. Override information table/by operator
  - 5. Run time information on equipment.
  - 6. Review of specific facility information by operators
  - 7. Graphics and interface as required for section 26 1010 energy metering points as required under the 2021 IECC. A minimum of 50 points of metering may be required.
- G. When specified alarm conditions occur, provide a report internally listing the status of specific items associated with the equipment generating the alarm.

- H. Report shall be routed to the local Host computer, District Host computer or other combinations of computers via Network as designated by the owner. Depending on the time of day, the owner shall specify up to five sites to which exceptions shall be auto-dialed and reported. This shall allow the owner to assign off hour's exception responses to various facility personnel as necessary. Selection of the sites to be dialed can be programmed by the owner and set to change automatically per time of day and day of week. Information may be duplicated to multiple combinations of locations. Report shall record the time the status information was taken and shall allow operational personnel to use this information to diagnose the alarm situation.
- I. All programming defining the functions to be performed by the master DDC control panel from loss due to power failure for a minimum of six months.
- J. The master DDC control panel shall be multi-tasking and shall provide the capability to simultaneously perform at least, but not limited to, the following functions: Downloading of application program changes without affecting the simultaneous operation of existing operating application programming.
- K. Operator access to the entire network of local digital controllers.

#### 2.16 LOCAL DDC CONTROL PANELS

- A. Local DDC control panels shall be located near mechanical systems as necessary to provide both digital and analog input and output points as specified and/or required to achieve specified system performance.
- B. Each local DDC control panel shall provide all control functions for the mechanical equipment specified to be controlled from that panel.
- C. Every input and output point shall be well labeled, and every digital output shall have a LED indication of the position of the output relay.
- D. ATC contractor shall provide documentation of the software application program for each digital controller.
- E. Documentation provided shall include block software flowchart showing the interconnection between each of the control algorithms and sequences. Complete ATC drawings including terminal connections shall be available at each local panel.
- F. System acceptance shall not be completed until this documentation is provided and located in each ATC interface panel.
- G. Systems providing modulating outputs via pulse width modulation techniques, shall provide within each ATC interface panel all the components required to implement the functions equivalent to an analog output.

## 2.17 ATC INTERFACE PANELS

- A. ATC interface panels shall be mounted near each group of local DDC controllers other than VAV box controllers. Each panel shall be made of not less than 16 gage steel. Panel shall have a full back plate and full hinged door such that when the door is closed, the assembly provides a completely enclosed, NEMA 2 enclosure. Panels shall be fully painted and fitted with key locks. Appropriately sized nameplates shall be used to identify all panel mounted devices. Major wiring within panels shall be installed within distribution gutters (similar to Panduit). All wiring entering and leaving panels shall terminate on numbered terminal strips. All wiring within panels shall be color coded and the color shall not be changed between the terminal strip and the end destination of that wire. Panels shall contain wiring diagrams of the panel interior and associated devices. Diagrams shall identify all interior devices and shall include terminal numbers.
- B. Panels shall contain the following devices as applicable:
  - 1. Control transformers
  - 2. NEC required fusing
  - 3. Local DDC controllers (owner requirement)
  - 4. NEC required grounding
  - 5. Logic relays
  - 6. 120 VAC convenience outlet
  - 7. Air pressure transmitters
  - 8. Control switches
  - 9. Pilot lights
  - 10. Terminal strips
  - 11. Status indicating lights

## 2.18 LABELING

- A. All ATC supplied panels and devices shall be permanently labeled with engraved plastic laminate labels indicating device name, system identifier and function within the system.

## PART 3 – SEQUENCE OF OPERATION

### 3.1 VAV FAN SYSTEMS

- A. The VAV fan systems each consist of a supply fan driven by a VFD, a return/relief fan driven by a VFD, a heating coil, a indirect cooling coil, evaporative cooling section, filters & outdoor air, return air and relief air dampers.
- B. The supply fan shall be started from a local DDC controller through a "OFF-AUTO" switch, located on the face of the VFD bypass panel.
- C. In "OFF" position, fan shall be stopped, and in "AUTO" position, fan shall be on during OCCUPIED mode and cycled to maintain minimum space temperature when in the UNOCCUPIED mode.
- D. Fan system operation in AUTO mode shall be subject to freezestat, building fire alarm, supply duct high static pressure, building optimal start-stop programs, and other conditions or logic pre-programmed into the DDC controllers.
- E. If the fan system is shut-down, or fails to start due to abnormal conditions, an alarm shall be sent to the DDC system. When the fan is stopped under any condition, the outside air damper and relief air dampers shall close.

- F. Analog current transmitters shall be installed on each fan in the fan wall system and wired in series. If any fan in the fan wall system fails to start, this fan failure point shall indicate a fan alarm to the DDC system.
- G. Fan status for proof of fan operation shall be by measuring the amps from each VFD to validate air flow.
- H. A manual reset, high limit pressure switch within the fan room sensing supply duct static pressure shall shut down the fan and alarm the DDC system if its 3" wc setting (adjustable) is exceeded.
- I. The fan system shall perform an optimal start program that shall include building warm-up and building purge features. A sliding window start shall be provided to allow the building to warm-up or purge in the least amount of time possible. As the air handler exits warm-up mode the outside air dampers shall be programmed with the appropriate delay before opening to prevent the freeze stat from inadvertently tripping.
  - 1. Warm-up mode shall only be initiated during the winter months between October 15th and April 15th (adjustable). In the warm-up mode, all outside air dampers and relief air dampers shall remain closed. During warm-up mode the air handler shall discharge 85°F and the VAV boxes served by the air handler shall reverse operation to increase air flow for heating instead of cooling. There shall be no minimum outside air damper position in warm-up mode.
  - 2. In purge mode, the cooling coil valve shall remain closed and the outside air dampers shall open to 100% to allow the air handler to discharge the coolest possible temperature into the building. In purge mode the relief damper system shall operate as in occupied mode. Purge mode shall only be initiated in the summer months between April 15<sup>th</sup> and October 15th (adjustable) and when the outside air temperature is above 45 degrees and below 72 degrees (adjustable).
- J. OCCUPIED mode: A supply air temperature sensor, an outdoor air temperature sensor, and a signal from the greatest cooling %Load of the VAV boxes acting through DDC controllers, shall modulate the heating coil valve, outdoor air, return air and relief air dampers, and indirect cooling coil and evaporative cooling section to maintain supply air temperature according to the following (ADJUSTABLE) schedule:

Primary Schedule

|                         |                        |
|-------------------------|------------------------|
| OUTSIDE AIR TEMPERATURE | SUPPLY AIR TEMPERATURE |
| 30°F                    | 60°F                   |
| 65°F                    | 55°F                   |

Secondary Schedule:

|                        |                        |
|------------------------|------------------------|
| GREATEST COOLING %LOAD | SUPPLY AIR TEMPERATURE |
| 0%                     | +10°F                  |
| 100%                   | +0°F                   |

- K. Whenever heating valve is not closed or when outdoor air temperature exceeds 76° F, the outside air and relief air dampers shall close to the minimum position as determined by the return duct CO2 level transmitter and minimum ventilation requirements.

- L. The outside air, relief air and return air dampers shall sequence as follows:
1. When no outside air is required, the outside air dampers & relief air dampers shall be shut and the return air dampers shall be 100% open.
  2. As outside air is required by the air handler for minimum outside air or economizer purposes, the outside air dampers shall begin to modulate open. During this time the return air dampers shall modulate opposite of the relief air dampers & the relief air damper shall modulate as required to maintain required building static pressure.
  3. At 50% outside air flow, both the outside air dampers and the return air dampers shall be 50% open & the relief air damper % open shall match outside air damper, or as required to maintain required building static pressure.
  4. As more than 50% outside air flow is required, the outside air dampers shall modulate to 100% open and the return air dampers shall begin to modulate closed.
  5. Relief air damper shall track opposite of outside air damper to 100% open, or as required to maintain required building static pressure.
  6. The reverse shall occur as less outside air is required.
- M. A 0-5" w.c. supply duct static pressure transmitter with its static tip located 2/3 of the way down the supply duct and acting through a DDC controller shall modulate supply fan speed to maintain the supply duct static pressure set point as described below:
- N. The supply duct static pressure set point shall be continually adjusted by the DDC controller through a PID control loop to ensure that at least one of the VAV box dampers served by the air handler is at least 85% open. The intent of this control loop is to ensure that the supply fan VFD operates at the lowest possible speed to maintain air flow requirements on all VAV boxes. The supply duct static pressure PID control loop shall adjust the discharge set point between 0.2" and 1.5" w.c. (adjustable) as required by the VAV box dampers.
- O. A CO2 level transmitter located in the return air duct, acting through a DDC controller, shall reset the outside air damper to minimum position. The amount of reset action shall be adjustable and subject to a maximum of 25% outdoor air.
- P. An averaging style mixed air temperature sensor, acting through a DDC controller, shall provide 48°F (adjustable) mixed air temperature low limit control of the air handling system.
- Q. If mixed air temperature drops below 39°F (adjustable) as sensed by an electrically interlocked averaging style freeze stat, supply and return/relief fans shall stop, outdoor and relief air dampers shall close and an alarm shall be sent to both the local and District Offices Host Computers.
- R. A -0.25 to 0.25"w.c. static pressure transmitter with an outside probe, and an interior probe strategically located in an interior hallway in area served by the correct fan system, acting through the DDC system shall modulate the relief dampers and return fan VFD in sequence to maintain 0.05"w.c. building static pressure. Individual control of the supply and return fan speeds shall be achievable by the DDC system controller.
- S. A temperature sensor shall be located inside of the building air handlers near each relief damper and within 4 feet of its opening to the outside. This temperature sensor shall be included as a low building space temperature reading. During extreme weather conditions this sensor is intended to prevent pipes and other equipment in the building from freezing. If any of these sensors fall below 50 degrees in the unoccupied mode, the fan system shall start to supply warm air to the plenum. Also, if any of the sensors fall below 35 degrees (adjustable) the relief dampers shall be commanded closed.

- T. The DDC system shall also provide negative building pressure control for the space that it serves. If the building static pressure begins to fall below the minimum building static pressure set point of 0.01" w.c., the controller shall send a signal to the outside air dampers to open to allow negative building pressure control.
- U. UNOCCUPIED mode: The lowest space temperature sensor served by the air handler, acting through a DDC controller, shall cycle the supply fan with the heating valve open 100% to maintain desired minimum space temperature.
- V. Outdoor air & relief dampers shall remain closed. Chilled water valve shall close to the coil when the supply fan is not running, and the evaporative cooling section shall be off.
- W. AHU-4 serving the administration area shall be supplied with a labeled occupancy override button and software override timer included on the graphics page. This button shall have a user adjustable override time to force the unit into occupied mode. The override buttons shall be equipped with an illuminated indication indicating that the override period is in progress.
- X. Override shall be provided on graphic pages to allow operator to override without utilizing occupancy schedule. Override shall be a timed override with a maximum set point of 240 minutes. (adjustable)
- Y. Daily runtime of EACH fan system shall be logged and displayed on the air handler graphic page. The runtime value shall be reset at the end of each day and the runtime of the fan shall be logged.

### 3.2 HEATING, VENTILATING, COOLING FAN SYSTEM CONTROL – AHU-1, AHU-2 & AHU-3

- A. Fan systems each consist of a variable speed supply and return/relief fan driven by a VFD, a heating coil, a indirect cooling coil, evaporative cooling section, filters, and outdoor air, relief air, and return air dampers.
- B. DDC controllers shall provide control and monitoring of each fan system. The fans shall be started from a local DDC controller through a "HAND-OFF-AUTO" switch located on the face of the VFD bypass panel.
- C. In "HAND" position, fan shall operate continuously; in "OFF" position, fan shall be stopped, and in "AUTO" position, fan shall be on during OCCUPIED mode and cycled to maintain minimum space temperature when in the UNOCCUPIED mode.
- D. Fan system operation in AUTO mode shall be subject to freeze stat, building fire alarm, supply duct high static pressure, duct supply and return smoke detectors, building optimal start-stop programs, and other conditions or logic pre-programmed into the DDC controllers.
- E. If the fan system is shut-down, or fails to start due to abnormal conditions, an alarm shall be sent to the DDC system. When the fan is stopped under any condition, the outside air dampers shall close.
- F. A manual reset, high limit pressure switch sensing supply duct static shall shut down the fan and alarm the DDC system if its setting is exceeded.
- G. Analog current shall be installed on each fan in the fan wall system and wired in series. If any fan in the fan wall system fails to start, this fan failure point shall indicate a fan alarm to the DDC system.
- H. Fan status for proof of fan operation shall be by measuring the amps from each VFD to validate air flow.

- I. OCCUPIED mode: A space temperature sensor (1 for each fan system), acting through DDC controllers shall modulate the heating coil valve to maintain desired heating space temperature. As the heating valve modulates open, the fan speed also increases. When valve is closed, fan speed shall be at minimum ventilation speed. When valve is open, fan speed shall be at maximum heating speed.
- J. Mixing dampers shall remain at minimum position as determined by the return air quality detection system whenever heating valve is not closed.
- K. As the space temperature rises to the desired cooling space temperature, fan speed shall increase from minimum ventilation speed to maximum cooling speed and the mixed air dampers shall modulate in sequence with the cooling coil valve to maintain the cooling temperature setpoint. When outdoor air temperature exceeds 76° F (adjustable), the outside air dampers shall close to the minimum position as determined by the return air CO2 detection system.
- L. A CO2 transmitter located in the return air duct and acting through a DDC controller, shall reset the outside air damper minimum position to maintain 850 ppm CO2. The amount of reset action shall be adjustable and subject to a maximum of 25% minimum outdoor air.
- M. A mixed air temperature sensor, acting through a DDC controller, shall provide 48° F (adjustable) mixed air temperature low limit control of the air handling system.
- N. During the occupied mode the automatic relief damper shall open, and the return/relief air fan shall modulate to maintain a slightly positive building pressure of 0.05" (adjustable) w.c. During the unoccupied mode, the return/relief air fan shall remain off, and relief air dampers shall be closed. Provide a building static pressure control system to control return/relief air fan variable frequency drive.
- O. UNOCCUPIED mode: The space temperature sensor, acting through a DDC controller, shall cycle the fan & heating valve to maintain desired minimum space temperature. Fan shall run at 60% maximum speed.
- P. Outdoor air & associated relief dampers shall remain closed. Chilled water valve shall close to the coil when the supply fan is not running, and the evaporative cooling section shall be off.

### 3.3 HEATING, VENTILATING, COOLING FAN SYSTEM CONTROL – AHU-4 & CU-1

- A. Fan system consists of a variable speed supply and return/relief fan driven by a VFD, a heating coil, a DX cooling coil section, filters, and outdoor air, relief air, and return air dampers.
- B. DDC controllers shall provide control and monitoring of each fan system. The fans shall be started from a local DDC controller through a "HAND-OFF-AUTO" switch located on the face of the VFD bypass panel.
- C. In "HAND" position, fan shall operate continuously; in "OFF" position, fan shall be stopped, and in "AUTO" position, fan shall be on during OCCUPIED mode and cycled to maintain minimum space temperature when in the UNOCCUPIED mode.
- D. Fan system operation in AUTO mode shall be subject to freeze stat, building fire alarm, supply duct high static pressure, duct supply and return smoke detectors, building optimal start-stop programs, and other conditions or logic pre-programmed into the DDC controllers.
- E. If the fan system is shut-down, or fails to start due to abnormal conditions, an alarm shall be sent to the DDC system. When the fan is stopped under any condition, the outside air dampers shall close.



- F. A manual reset, high limit pressure switch sensing supply duct static shall shut down the fan and alarm the DDC system if its setting is exceeded.
- G. Analog current shall be installed on each fan in the fan wall system and wired in series. If any fan in the fan wall system fails to start, this fan failure point shall indicate a fan alarm to the DDC system.
- H. Fan status for proof of fan operation shall be by measuring the amps from each VFD to validate air flow.
- I. OCCUPIED mode: A space temperature sensor (1 for each fan system), acting through DDC controllers shall modulate the heating coil valve to maintain desired heating space temperature. As the heating valve modulates open, the fan speed also increases. When valve is closed, fan speed shall be at minimum ventilation speed. When valve is open, fan speed shall be at maximum heating speed.
- J. Mixing dampers shall remain at minimum position as determined by the return air quality detection system whenever heating valve is not closed.
- K. As the space temperature rises to the desired cooling space temperature, fan speed shall increase from minimum ventilation speed to maximum cooling speed and the mixed air dampers shall modulate in sequence with the associated condensing unit CU-1 to maintain the cooling temperature setpoint. CU-1 shall be energized and modulate stages on the factory pre-set controls. When outdoor air temperature exceeds 76° F (adjustable), the outside air dampers shall close to the minimum position as determined by the return air CO2 detection system.
- L. CU-1 shall only run when AHU-1 is unable to meet space temperature setpoint in economizer mode. When a call for cooling CU-1 shall be staged by means of factory controls to maintain required discharge air temperatures. A delay may need to be provided to avoid unnecessary start/stops of CU-1 and related compressors.
- M. A CO2 transmitter located in the return air duct and acting through a DDC controller, shall reset the outside air damper minimum position to maintain 850 ppm CO2. The amount of reset action shall be adjustable and subject to a maximum of 25% minimum outdoor air.
- N. A mixed air temperature sensor, acting through a DDC controller, shall provide 48° F (adjustable) mixed air temperature low limit control of the air handling system.
- O. During the occupied mode the automatic relief damper shall open, and the return/relief air fan shall modulate to maintain a slightly positive building pressure of 0.05" (adjustable) w.c. During the unoccupied mode, the return/relief air fan shall remain off, and relief air dampers shall be closed. Provide a building static pressure control system to control return/relief air fan variable frequency drive.
- P. UNOCCUPIED mode: The space temperature sensor, acting through a DDC controller, shall cycle the fan & heating valve to maintain desired minimum space temperature. Fan shall run at 60% maximum speed.
- Q. Outdoor air & associated relief dampers shall remain closed.

### 3.4 PACKAGED ROOFTOP UNITS

- A. The package rooftop unit is a gas fired DX cooling unit with economizer.
- B. The controls contractor shall provide heating / cooling thermostats and wiring as required for a functioning system. The thermostat shall be connected directly to the DDC control system network and communicate via BACnet to the DDC system. The DDC system shall enable each RTU and provide room thermostat in each area to report the space temperature to the DDC system. A fan status point shall also be tied to the DDC system and an alarm shall be generated whenever the RTU is turned on and the fan fails to start. During occupied mode, the fan shall run continuously, and the temperature control shall be by the thermostat. The space temperature, fan status, output stages and time scheduling shall all be shown on the DDC system. During unoccupied mode, the fan system shall be enabled when the temperature sensor in the space exceeds its low limit value.
- C. The control contractor shall wire to the factory provided Terminal Strip or as required for system provided.

### 3.5 PACKAGED AC UNIT – DRY STORAGE

- A. The packaged AC unit is a cooling only unit.
- B. The controls contractor shall install the factory provided hard wired cooling thermostat. In addition, a DDC space temperature sensor shall be provided and installed to monitor the space temperature. An alarm shall be sent if the space temperature is outside of the OSD determined parameters.

### 3.6 FIRE ALARM FAN SHUT-DOWN: (All Fan Systems)

- A. All heating, ventilating and air conditioning system supply fans shall automatically shut off when the building fire alarm system is energized. All fans to automatically start up again when fire alarm system is reset. Fire alarm system fan relays shall be "normally energized" and shall be installed by Division 26 at each fan system.

### 3.7 FAN SYSTEM FILTER BANK ALARMS

- A. A differential pressure indication control element with its static pressure tips located across each fan system filter bank & makeup air unit filter bank shall provide the DDC system with the differential pressure drop across each filter bank. An alarm shall be supplied to the DDC system whenever the filter differential pressure remains above 0.35" w.c. for more than 15 continuous minutes.

### 3.8 COOLING TOWER OPERATION – INDIRECT COOLING SYSTEM

- A. The Cooling Tower shall be enabled when two or more air handling units discharge air temperatures cannot maintain 56-degree F leaving air temperature for at least 30 minutes with direct evap. cooling alone.

B. System Operation

1. There are 2 cooling/condenser water pumps (P-5 & P-6). The pumps when enabled one pump is placed in the lead position. When the Cooling Tower is enabled, the lead pump shall start, and the condenser water shut off valve shall open. The condenser water shut off valve shall be fast acting valve capable of 15 second maximum stroke time from 100% closed to 100% open and remain open with pump running continuously. Alternate primary and back up pumps to achieve equal running time. Coordinate alternating schedule with Owner. If the lead pump fails, the lag pump starts and runs through the remainder of occupied time period.
2. The cooling/condenser pump VFD shall provide a soft start and be set to run at constant speed achieving the designed flow.
3. When panel mounted toggle HAND-OFF-AUTO (H-O-A) switch are in the AUTO position, these pumps will be controlled by the building energy management system (BMCS).
4. In unoccupied mode the condenser pump will be off, and the condenser water shutoff valve shall be closed. The shut off valve shall close when pump is off.

3.9 AIR HANDLERS

- A. The air handlers shall use an exterior building sensor to monitor the outside air temperature when the air handler is off. When the air handlers are on the DDC system shall use the outside air temperature reported.
- B. The fan system shall perform an optimal start program that shall include building warm-up and building purge features. In the warm-up mode, all outside air and relief air dampers shall remain closed. The relief fan shall remain off, the air handler shall modulate the heating coil valve to maintain space temperature set point. In the purge mode, the cooling shall remain off, the outside air dampers shall remain open to 100%, the return air dampers shall be closed, and the relief air system shall control to maintain the building static pressure set point. This will allow the air handler to discharge the coldest possible air temperature into the building. in purge mode, the relief fan shall operate as in the occupied mode.
- C. OCCUPIED mode: The supply air temperature sensor and outdoor air temperature sensor, acting through the DDC controllers, shall modulate the preheat coil valve, stage the indirect cooling system, modulate the chilled water valve, outdoor air and return air dampers, stage the evaporative cooling and modulate the supply fan VFD to maintain supply air temperature based on the following schedule:

| GREATEST VAV COOLING LOAD | SUPPLY AIR TEMPERATURE |
|---------------------------|------------------------|
| 0%                        | 70°F                   |
| 100%                      | 55°F                   |

- D. The preheat/heating coil, indirect cooling coil, outside air and return air dampers, and evaporative cooling stages shall operate in sequence as described below to maintain the supply air temperature set point. A discharge sensor of each heating and cooling stage shall be provided and displayed on the air handler graphic.
- E. The operating sequence for the outside and return air dampers shall be as follows: When a call for more outside air is received, the outside air dampers shall modulate open while the return air dampers remain at 100%. Once the outside air dampers are at 100% open, the return air dampers shall begin to modulate closed. When a call for less outside air is received, the above sequence shall be reversed. The purpose is to keep the dampers open as much as possible to minimize the pressure drop across the dampers to save fan energy and provide better controllability.

- F. A single PID control loop shall control the staging of the heat and cooling stages of the air handler to maintain discharge temperature set point. The single PID control loop shall ensure that there is no overlap between heating and cooling stages. The PID control loop shall find and continually adjust the appropriate discharge air temperature needed to satisfy the space temperature set point. There shall be a 4-degree F (adjustable) dead-band between the heating and cooling set point of the space. The initial heating set point shall be 70 deg. F and the initial cooling set point shall be 74 deg. F (adjustable).
- G. The preheat coil valve shall modulate open as required when the entering air of the air handler is cooler than discharge air temperature set point.
- H. The cooling section consists of direct evaporative cooling with a bypass damper, and an indirect cooling coil. The cooling system is an important energy saving feature of the air handler.
- I. A relative humidity sensor shall be installed in the building relief air inlet to monitor building space humidity.
- J. A temperature sensor shall be installed in the return air section of the air handler.
- K. The outside air dampers are the first stage of cooling. When the outside air dampers are fully open, the second stage of cooling shall be utilized. The outside air dampers shall remain fully open for all cooling stages following the modulating economizer stage.
- L. The second stage of cooling is the evaporative cooling section. An evaporative cooling enabled check box shall be provided on the graphics page to allow the operator to disable the evaporative cooling in the winter season. The evaporative cooling system once enabled in a day shall remain enabled for the remainder of the day. Do not cycle evaporative cooling pump. The evaporative cooling will have a primary and stand-by pump shall run. Discharge air temperature set point shall be 55 Degrees F once direct evap. Is enabled, do not reset discharge air temperature up when direct evaporative cooling is enabled or too high of space humidity can result.
  - 1. Evaporative cooling enabled.
    - a. Primary drain control valve closed.
    - b. Make-up water control valve opened.
    - c. Flush down control valve closed.
  - 2. Pump Enabled.
    - a. If evaporative section is enabled, then pump is energized at outlet.
    - b. Leave evaporative section on and control LAT via indirect coil or bypass damper.
    - c. Do Not control LAT by cycling pump.
  - 3. Evaporative cooling disabled.
    - a. Evaporative pump de-energized at outlet.
    - b. Make-up water control valve closed.
    - c. Primary drain control valve open. Allow 5-minute delay(adjustable) for sump and media to drain out.
  - 4. Flush down cycle.
    - a. Ensure the evaporative section is disabled.
    - b. Open flush down control valve. Leave valve open for 5 minutes (adjustable)

5. Emergency water level sensor. Install water level sensor between over flow drain & top of sump.
  - a. Evaporative section enabled – False.
  - b. Flush down cycle – False.
  - c. Send alarm to BMS/Security.
  
- M. The indirect cooling coil is the third stage of cooling. Since all air handlers on this IDEC system are overhead cooling, the discharge air sensor shall be used to stage the indirect cooling on. There is no control valve on the indirect cooling it shall not be enabled until discharge air conditions indicate it is needed. Since indirect cooling isn't enabled until it is needed full capacity is then intended. Indirect cooling shall not be enabled until at least two air handlers indicate it is needed. Once a discharge air temperature of 56 degrees F cannot be maintained for at least 30 minutes with direct evap. alone then indirect cooling shall be enabled.
  
- N. A 0-5" w.c. supply duct static pressure transmitter shall be located 2/3 of the way down the supply duct and acting through a DDC controller shall modulate supply fan speed to maintain the supply duct static pressure set point as described below.
  
- O. The supply duct static pressure set point shall be continually adjusted by the DDC controller.

### 3.10 HOT WATER HEATING SYSTEM CONTROL

- A. The building heating water heating system consists of (2) boilers and related boiler heating water pumps P-1 & P-2.
  
- B. Boilers and associated pumps are enabled when OAT is less than 60 Deg F. (adjustable). HW building pumps (P-1 & P-2) shall be monitored and controlled by the DDC. HW supply and return temperature shall be monitored by a Stainless-Steel temperature sensor mounted in a Stainless-Steel thermal well.
  
- C. There are 2 variable speed building heating water pumps (P-3 & P-4). Pumps operate during the OCCUPIED and WARM-UP modes and are each rated at 100% of the building load. Pumps shall be operated via a system pressure differential transmitter.
  
- D. When the panel mounted toggle HAND-OFF-AUTO (H-O-A) switches are in the AUTO position, these pumps will be controlled by the building energy management system. During the OCCUPIED or WARM-UP modes, if the outside temperature is below 60 degrees F.(adjustable), pump will start. Pumps shall lead/lag based on schedule from the DDC system.
  
- E. When the panel mounted toggle HAND-OFF-AUTO (H-O-A) switch is in the AUTO position, the boiler is enabled by the building management system. The boilers will be enabled whenever one or more of the heating pumps are running. Once enabled, the boilers operate from their operating and safety controls.
  
- F. When air handling or rooftop units are off, the DDC system shall command the hot water valves closed.
  
- G. If the room temperature falls below 50 Deg F. (adjustable), the building DDC shall generate an alarm.

- H. Static water pressure transmitters with pressure sensing taps located in both the heating water supply & return lines at locations approved by the Mechanical Engineer and acting through a DDC controller shall modulate the speed of the hot water pump(s) to maintain desired hot water system differential pressure. (Initial differential pressure setting shall be 10 psig) The first heating water pump shall start & run continuously when the outdoor air temperature is 75° F or lower (adjustable). The second pump shall start and run in parallel with the first pump when the outdoor air temperature is below 35° F. (adjustable).
- I. If a hot water pump is not running when commanded to do so by the DDC system, the other hot water pump shall automatically start & an alarm shall be sent to the DDC system.
- J. When water flow through a boiler is detected by a paddle-type water flow switch located in the return water line to the boiler, the boiler control system shall be enabled.
- K. Once enabled the boilers shall be staged on a lead-lag basis through the building DDC system. The lead boiler shall automatically alternate every month. The lag boilers shall operate only when the lead boiler cannot maintain the desired hot water supply temperature per the outdoor air temperature reset schedule shown below. If for any reason the lead boiler fails, the lag boiler shall energize to maintain building water temperature.
- L. Interlock the boiler controls to allow operation only when water flow exists through the boiler as determined by a flow switch installed in the boiler's heating water piping.
- M. Provide interlocks with each boiler alarm system to alarm the DDC system if boiler shuts down due to flame failure, etc. or if boiler does not fire when commanded to do so.
- N. Provide analog temperature sensors in immersion wells in the hot water supply piping of each boiler as well as the main supply and return water lines leaving the boiler room.
- O. A local DDC controller with analog temperature sensors located in both the supply water and the outdoor air shall modulate hot water reset to maintain building supply water temperature (reset from outdoor temperature) as follows (adjustable):

| Outdoor Air Temperature | Supply Water Temperature |
|-------------------------|--------------------------|
| 70°F                    | 90°F                     |
| 0°F                     | 140°F                    |

- P. Provide supply and return temperature sensors in the heating hot water piping at each boiler, analog current sensors for all heating pumps.

3.11 EMERGENCY SHUTDOWN SWITCHES (Boilers B-1 & B-2)

- A. A remote mushroom type, single acting, manually reset, shutdown switch shall be located just inside the boiler room door and marked for easy identification. A pilot light shall illuminate whenever the push button is pressed. If there is more than one door to the boiler room, there should be a switch located at each door.
- B. The emergency shutdown switches when activated must disconnect all power to the boiler burner controls. A visual alarm indicator of a different color than the building fire alarm indicator shall be activated when the boilers are shutdown.

### 3.12 BOILER ROOM VENTILATION CONTROL

- A. A room temperature sensor, acting through a DDC controller shall cycle ventilation fan VF-1 to maintain desired boiler room temperature.

### 3.13 TOILET ROOM EXHAUST FANS

- A. Ceiling mounted toilet room exhaust fans shall be individually operated by pre-determined schedules from the building DDC system. ATC system to provide and alarm if fan status does not meet command.
- B. Roof mounted toilet room exhaust fans shall be individually operated by pre-determined schedules from the building DDC system. ATC system to provide and alarm if fan status does not meet command. ATC system to provide and alarm if fan status does not meet command.

### 3.14 ELECTRICAL ROOM VENTILATION FAN CONTROL

- A. Exhaust fan shall be cycled by an electric, cooling type, wall thermostat with dial adjustment. Room temperature shall be monitored through the building DDC system and Lan Network. Electrical room with roof hoods with ATC dampers shall interlock damper to open when exhaust fan is operating.

### 3.15 JANITORS ROOM EXHAUST FAN CONTROL

- A. Each janitor's room exhaust fan shall be individually controlled as programmed in the building DDC system. ATC system to provide and alarm if fan status does not meet command.

### 3.16 FREEZER AND COLD STORAGE TEMPERATURE ALARMS

- A. Provide an analog DDC temperature sensor for each freezer and cold storage area. An alarm to the District remote security facility through the Lan Network shall be generated whenever temperatures **drop below or above** the owner determined limits via a status contact closure to the security system. System must be configured to follow the alarm requirements defined within this specification.

### 3.17 FIRE RISER ROOM TEMPERATURE ALARMS

- A. Provide an analog DDC temperature sensor at fire riser room. An alarm to the District remote security facility through the Lan Network shall be generated whenever temperatures drop below or rises above the owner determined limits. Coordinate with Division 26.

### 3.18 DATA/SERVER ROOM TEMPERATURE ALARMS

- A. Provide an analog DDC temperature sensor at Data/Server room. An alarm to the District remote security facility through the Lan Network shall be generated whenever temperatures rise above the owner determined limit. Coordinate with Division 26.

### 3.19 VAV BOX CONTROL W/ REHEAT COILS

- A. Room space temperature sensing shall be from wall-mounted temperature sensing elements with adjustable set points. A duct style temperature sensor shall be installed at each VAV box air discharge.

- B. The ATC contractor will wire to the room occupancy sensor supplied and installed by Division 26 for lighting. The Division 26 contractor will provide occupancy sensors with a dry contact for use by the ATC contractor to hard wire directly to the VAV box controllers. The VAV controller will be programmed to go to unoccupied set points when no occupancy is detected by the sensor. Upon occupancy detection, by the lighting sensor, the VAV box controller will automatically return to occupancy set points and operation provided the building occupancy schedule and/or the schedule for the VAV box zone is on by the master DDC control system schedule.
- C. Each VAV box shall display current KBTU discharging into the space. The ATC contractor shall provide all hardware, software and configuration to provide KBTU per VAV box. Values shall be displayed on the graphic pages, trended and alarmed with user adjustable alarm limits. The DDC system shall accumulate KBTU going into the space to display daily total heating KBTU and daily total cooling BTU consumed. The KBTU totals shall be logged into the controls database and utilized for required energy alarming. BTU per square foot, as determined by the area served square footage shall be displayed per VAV box and configured for high per square foot alarming.
- D. The occupancy schedule for the 3-position VAV controller shall be adjustable and configured in the DDC system. The DDC control system shall return the VAV box to an unoccupied state as determined by the building occupancy time schedule (adjustable). Unoccupied set up and set back settings shall be configured and completely adjustable.
- E. A VAV box mounted DDC controller shall be provided for control and operation of each VAV box and reheat coil. The sensor shall modulate the box primary air damper between minimum ventilation position and maximum designed airflow and position the reheat coil valve in sequence to maintain the desired space temperature. Heating and cooling set points shall be individually adjustable from the man-machine interface device (Host computer) or the District offices.
- F. Each VAV box shall be configured for central plant heat mode which shall reverse the operation of the VAV damper to open for heating instead of cooling whenever the air handler is in the warm-up mode.
- G. Each VAV box shall be configured and programmed for CFM set point modulation based on system variable as detailed in the Sequence of Operation. The ATC contractor shall demonstrate the program and the freely programmable VAV DDC controller.
- H. Each VAV box DDC controller shall have a 24-volt power connection with all 24-volt control wiring by the ATC contractor. 24-volt transformers shall be located in the DDC controller of the air handler serving the VAV box for ease of maintenance.

### 3.20 AHU-2 MUSIC ROOM REHEAT COIL HC-1

- A. Room space temperature sensing shall be from wall-mounted temperature sensing elements with no adjustment or visible temperature indication. Any adjustments will be made remotely by OSD District personnel. A duct style temperature sensor shall be installed at each re-heat coils air discharge.
- B. A duct mounted DDC controller (located in fan room) shall be provided for control and operation of each reheat coil. The sensor shall modulate the box primary air damper between minimum ventilation position and maximum designed airflow and position the reheat coil valve in sequence to maintain the desired space temperature. Heating and cooling set points shall be individually adjustable from the man-machine interface device (Host computer) or the District offices.



- C. Sensor shall modulate the associated damper from Minimum position when no call for heat. Associated damper shall open to 60% (adjustable) when a call for heat is received. Damper shall be open 100% when there is a call for cooling. Re-Heat valves shall open as required to maintain zone space temperature.

### 3.21 MDF/IDF/ELECTRICAL ROOM COOLING CONTROL

- A. Packaged cooling unit shall be cycled by an electric, cooling type, wall thermostat.
- B. A DDC space temperature sensor shall monitor and send alarm to OSD office if temperature is outside of pre-determined set points.

### 3.22 KITCHEN EXHAUST FAN & MAKE-UP AIR UNIT CONTROL

- A. Install duct thermostat and remote-control panel furnished by make-up air unit manufacturer in custom panel as indicated on plans. Interlock make-up air unit with kitchen exhaust hood fans and wire them to stop upon kitchen hood fire sprinkler activation.
- B. The ATC contractor shall integrate the ATC panel for control of the kitchen exhaust hood systems into the UDS wall. This panel shall incorporate the make-up air unit control panels, and in addition shall have fan switches and pilot lights for control of kitchen hood fans. Provide an "on-off" switch and pilot light in the control panel to control the dishwasher exhaust fan. In addition, a DDC interface to the District shall be provided to indicate operational status and discharge temperature of each makeup unit.
- C. Provide a heat sensor in each hood section. When activated, the sensor shall energize make-up air units and hood exhaust fans.

### 3.23 DISHWASHER EXHAUST FAN CONTROL

- A. Provide an interlock to control the dishwasher exhaust fan. The exhaust fan shall run when the dishwasher and booster heater are operating. The DDC system shall include a proof of status for the exhaust fan operation.

### 3.24 KITCHEN GAS SHUT-OFF SYSTEM

- A. All-natural gas supplied to the kitchen shall be shut off upon kitchen hood fire suppression system is activated. This shall be done by mechanical means. Mechanical gas valve shall be provided by kitchen equipment supplier.
- B. Upon actuation of the kitchen hood fire extinguishing system a flow switch (provided with the fire system) shall be actuated causing the existing line size automatic gas valve to close. This valve shall remain closed until manually reset by a "KITCHEN NATURAL GAS: OFF-NORMAL" indicator switch with a pilot light. This reset unit shall be located at the make-up air unit control panels. The pilot light shall indicate that the valve has been closed by the emergency circuit.
- C. The ATC contractor shall perform a field test of this system and provide a letter of certification to the Architect that the system functions as specified.

### 3.25 FIN TUBE RADIATION CONTROL

- A. A DDC thermostat shall operate the heating valve when space temperature is outside of owner determined setpoint.

### 3.26 DOMESTIC WATER FLOW SECURITY SENSOR

- A. A paddle type, water flow sensor located in the smaller of the two lines in the main domestic water line and upstream from the pressure reducing valve, shall through the DDC system, signal the Host computer any time flow is sensed during the UNOCCUPIED mode. Division 25 contractor shall run line to building security dam for tie into building security system. The paddle shall be a Potter Model VSG (3-GPM) and shall be furnished and wired by the ATC contractor and installed by the plumbing contractor. ATC contractor to coordinate size required. Provide status contact closure to the security system. Coordinate line to security panel with Division 26.
- B. Main building flow switch shall be located downstream of cooling tower make-up water connection.
- C. Water meter for main building PRV shall be located upstream of cooling tower make-up water connection.
- D. Paddle is available from ADI (801) 972-8787.

### 3.27 DOMESTIC HOT WATER SYSTEMS

- A. There are two domestic hot water heating systems; (2) 120°F & (1) 140°F. Systems consist of a hot water heater, water heater pump, storage tank and recirculation pumps.
- B. When the building is in OCCUPIED mode, the main 120°F system hot water heater and its recirculation pumps shall be enabled & the recirculating pump shall run continuously. When the building is in UNOCCUPIED mode, the hot water heater and the recirculating pump operation shall be by a pre-determined schedule controlled thru the DDC system.
- C. When the kitchen is in use, the 140°F system hot water heater shall be enabled & the recirculation pump shall cycle from a strap-on sensor to maintain 130°F return water temperature. When the kitchen is not in use, the hot water heater & the recirculation pump shall remain off.
- D. Once enabled by the DDC system, the domestic hot water heaters shall operate under their factory supplied controls.

### 3.28 BOILER ROOM GAS FIRED UNIT HEATER CONTROL

- A. A room temperature sensor, acting through a DDC controller, shall cycle unit heater fan to maintain desired boiler room space temperature.

### 3.29 UNIT HEATER CONTROL

- A. A wall-mounted line voltage thermostat shall cycle the heating water valve and fan to maintain space temperature setpoint. A strap-on thermostat on the hot water line leaving the coil shall prevent fan operation if heat is not available.
- B. Electric unit heaters & electric wall heaters shall be controlled with a room thermostat reading to the BMS.

### 3.30 GAS FIRED UNIT HEATER CONTROL

- A. A room temperature sensor, acting through a DDC controller, shall cycle the gas fired unit heater to maintain desired room space temperature as the 2<sup>nd</sup> stage of heat.

- B. In-floor heating system shall be 1<sup>st</sup> stage of heat, gas fired unit heaters shall be programed as 2<sup>nd</sup> stage of heat.

### 3.31 GLYCOL FEED SYSTEM

- A. The ATC contractor shall provide all interlock and remote sensor wiring to provide a complete operational summer/winter glycol feed system. All equipment required shall be provided and installed by others. All wiring of GF-1 by ATC contractor.

### 3.32 COOLING TOWER CHEMICAL TREATMENT

- A. The ATC contractor shall provide all interlock and remote sensor wiring to provide a complete operational cooling tower chemical treatment system. All equipment required shall be provided and installed by others.

### 3.33 EXHAUST FAN

- A. The Faculty Room and Severely Disabled Room exhaust fans shall be controlled by a wall switch furnished and installed by the ATC contractor.

### 3.34 ELEVATOR EQUIPMENT ROOM

- A. A room thermostat, initially set at 80 deg. F. (adjustable) shall cycle exhaust fan to maintain desired space temperature. A motorized inlet air damper shall open when exhaust fan starts.

### 3.35 HEATING, VENTILATING, DX COOLING AHU-1 SYSTEM CONTROL

- A. Fan systems consist of a supply fan, a filter bank, a hot water heating coil, outdoor air, return air dampers, and a DX cooling coil with associated dual-stage condensing unit CU-1.
- B. The supply fan shall be started from a local DDC controller through a "HAND-OFF-AUTO" switch, located on the face of the panel. Relief fan shall run when the supply fan is running and the outside air damper is more than 55% open.
- C. In "HAND" position, fan shall operate continuously; in "OFF" position, fan shall be stopped, and in "AUTO" position, fan shall be on during OCCUPIED mode and cycled to maintain minimum space temperature when in the UNOCCUPIED mode.
- D. Fan system operation in AUTO mode shall be subject to freezestat, building fire alarm, building optimal start-stop programs, and other conditions or logic pre-programmed into the DDC controllers.
- E. If the fan system is shut-down, or fails to start due to abnormal conditions, an alarm shall be sent to the DDC system. When the fan is stopped under any condition, the outside air damper and relief air dampers shall close. Damper shall not begin to open until proof of status has been made.
- F. The controlling space temperature sensor, acting through DDC controllers, shall modulate the heating coil valve, outdoor, return air dampers, and DX system in sequence to maintain desired space temperature.
- G. Mixed air low limit shall be 48 deg. F. (adjustable). An air quality sensor located in the return air stream shall control outside air dampers to maintain a minimum of 800-900 ppm CO<sub>2</sub>.
- H. DX staging (dual-stage) will be by Air Handling Unit's internal controller to meet discharge air temperature signal from BMS.

- I. Fan status for proof of fan operation shall be by measuring the amps from each VFD to validate air flow.
- J. A manual reset, high limit pressure switch within the fan room sensing supply duct static pressure shall shut down the fan and alarm the DDC system if its 3" wc setting is exceeded.
- K. During the occupied mode the automatic relief damper shall open, and the return/relief air fan shall modulate to maintain a slightly positive building pressure of (adjustable) w.c. During the unoccupied mode, the return/relief air fan shall remain off, and relief air dampers shall be closed. Provide a building static pressure control system to control return/relief air fan variable frequency drive.
- L. Operation will follow the Sequence of other Air Handling Units with the exception of the DX being the second and final stage of cooling.

### 3.36 BUILDING ENERGY METERS

- A. The ATC contractor shall provide and install an electric KWH meter on the main building power entrance. The power data shall be displayed on the graphics pages which shall include the following. Current KW demand, Daily High KW demand, Monthly High KW demand, Daily Total KWH consumption, and Monthly Total KWH consumption. Daily power data from the power meters shall be logged into the database of the control system. The control system shall generate reports showing the history of the power usage in the building by month, by year, or month to month or year to year comparisons. The ATC contractor shall provide all necessary hardware and software.

### 3.37 ENERGY ALARMS AND AREA SECURITY TEMPERATURE ALARMS

- A. Alarms shall be provided and configured to report to the alarm responder and energy user interface. Email accounts and text message alarms shall be configured to alarm details as designated by the owner.
- B. Energy alarms shall include the following, quantities per equipment in the facility:
  - 1. Runtime Fan
  - 2. Runtime Pump
  - 3. Temp Low Space
  - 4. Temp Low Hot Water
  - 5. Temp High Freezer Cooler (High and Low Alarms for each)
  - 6. CO2 alarm
  - 7. Domestic Water Flow
  - 8. Failure Fan
  - 9. Failure Pump
  - 10. Failure Boiler Flame
- C. Each non-runtime individual alarm will have an attachment that is linked to the main graphic for the individual building. Each individual CO2 alarm will be displayed on the graphic pages and alarm information shall provide the exact location of the sensor.
- D. Temperature sensors located in an area served by each fan system shall continuously monitor the space temperature and alarm the building Host computer anytime the space temperature drops below or rises above preset set points. The Host computer shall then notify the District Remote Security Facility that an alarm has occurred via a status contact closure o the security system.

- E. Upon receiving an alarm, the Host computer at the school and at the District Offices shall indicate which area(s) of the building are in alarm through a graphic floor plan and/or text message display of the building(s). Current space temperatures shall also be displayed at the Host computer.

### 3.38 HOST COMPUTER & BUILDING GRAPHIC DISPLAY

- A. Graphics pages shall be created to remain consistent with the existing graphics on the districts host computer. Floor plans, air handler summaries, and alarm pages, equipment pages, summary pages, etc. shall all be included. In addition to this section, the ATC contractor shall refer to section 2.13 and other sections within this specification for user interface, alarming, programming and configuration requirements from the graphical user interface (Host Computer).
- B. User views shall be configured and display the specified information as defined by section 2.13 and this section.
- C. The building shall be represented by complete graphical floor plans, with accurate locations of each major piece of HVAC equipment. Each piece of HVAC equipment shall be graphically represented at each Host computer with all appropriate DDC points dynamically represented. The ATC contractor shall supply and install any and all software required, and leave with the owner, that permits full capabilities including programming, graphic page alterations, creations, system additions, modifications, controller additions, alarm configuration, alarm notification, trending, scheduling and permit full access to all features, set up and configuration of the DDC control system in its entirety.
- D. Table view or spread sheet style graphics shall be included for air handlers:
  - 1. The table view graphics page shall summarize the air handlers in the building by looking at a single graphics page.
  - 2. Summarized information for each air handler shall include:
    - a. Air Handler / RTU number
    - b. Occupancy state
    - c. Fan Status
    - d. % Heating or Cooling load of the Air Handler
    - e. High Space Temp
    - f. Low Space Temp
    - g. High VAV Damper Position (for VAV air handlers)
    - h. High VAV %Load (for VAV air handlers)
    - i. Duct Static Pressure
    - j. Discharge Temperature
    - k. Total Daily Runtime (resets at midnight)
    - l. Optimum Start Runtime (shows daily start time required)
  - 3. The above data will be used for continuous commissioning purposes and energy management.
- E. All graphics of air handlers, chillers, and boiler systems shall include daily equipment runtime values that reset each midnight.
- F. Run times of all air handlers, relief fans, exhaust fans, boilers, chillers, and equipment pumps shall be logged at the host computer. The ATC contractor shall provide runtime reports to enable monitoring of the building's performance.

**BUILDING DDC SYSTEM INPUT/OUTPUT POINT SUMMARY:**

The ATC contractor shall furnish and install all DDC controllers, sensors, interface relays, wiring and other field accessories for the DDC system to provide for implementation of the above sequences of operation and including the input-output points listed below. All points shall be displayed on password-protected graphic screens on both the existing District host computer and the man-machine interface or Host computer located in the Main Custodial office.

**DIGITAL OUTPUTS:**

|   |                |
|---|----------------|
| COOLING TOWER (each individual section) | START-STOP     |
| CHILLED WATER PUMPS (each pump)         | START-STOP     |
| CONDENSER WATER PUMPS (each pump)       | START-STOP     |
| LIGHTING CONTROL                        | ON/OFF         |
| SUPPLY FAN VFD (each VFD)               | START-STOP     |
| RETURN/RELIEF FAN (each VFD)            | START-STOP     |
| AHU UV STERILIZATION SYSTEM             | ON-OFF         |
| MAIN HEATING PUMPS (each pump)          | START-STOP     |
| 110° F CULINARY SYSTEM                  | ENABLE-DISABLE |
| 140° F CULINARY SYSTEM                  | ENABLE-DISABLE |
| HEATING UNITS (each heater)             | ENABLE-DISABLE |
| STUDENT TOILET ROOMS E.F. (each fan)    | START-STOP     |
| PACKAGED ROOFTOP UNITS                  | START-STOP     |
| FUTURE SOLAR ARRAY                      |                |
| SITE LIGHTING                           |                |
| FUTURE USE BY OWNER (6 outputs)         |                |

**DIGITAL INPUTS:**

|   |                 |
|---|-----------------|
| COOLING TOWER (each individual section)       | RUN STATUS      |
| TOWER FAILURE ALARM (each fan)                | SAFETY SHUTDOWN |
| TOWER CONDENSER WATER FLOW                    | STATUS          |
| RETURN/RELIEF FAN VFD                         | STATUS          |
| RETURN/RELIEF FAN VFD                         | FAULT           |
| BOILER HOT WATER (EACH BOILER)                | FLOW            |
| DOMESTIC WATER FLOW SENSOR                    | STATUS          |
| BUILDING FIRE ALARM SYSTEM                    | STATUS          |
| SMOKE DETECTORS (each individual detector)    | STATUS          |
| LOW LIMIT THERMOSTAT                          | STATUS          |
| SUPPLY DUCT HIGH STATIC                       | STATUS          |
| OVERRIDE TIMERS                               | STATUS          |
| HEATING WATER PUMPS VFD                       | STATUS          |
| HEATING WATER PUMPS VFD                       | FAULT           |
| COOLING WATER PUMPS                           | STATUS          |
| CONDENSER WATER PUMPS                         | STATUS          |
| CONDENSER WATER FLOW                          | STATUS          |
| COOLING TOWER FAN VFD                         | STATUS          |
| COOLING TOWER FAN VFD                         | FAULT           |
| DOMESTIC WATER FLOW                           | STATUS          |
| DOMESTIC WATER METERS                         | STATUS          |
| BUILDING POWER CONSUMPTION (each power meter) | PULSE           |
| FUTURE USE BY OWNER (4 inputs)                |                 |

ANALOG INPUTS:

|   |            |
|---|------------|
| COOLING WATER SUPPLY  | TEMP       |
| COOLING WATER RETURN  | TEMP       |
| CONDENSER WATER SUPPLY                                      | TEMP       |
| CONDENSER WATER RETURN                                      | TEMP       |
| HOT WATER SUPPLY  | TEMP       |
| HOT WATER RETURN  | TEMP       |
| CULINARY 120° F STORAGE TANK                                | TEMP       |
| CULINARY 140° F STORAGE TANK                                | TEMP       |
| BOILER WATER SUPPLY (EACH BOILER)                           | TEMP       |
| OUTDOOR   | TEMP       |
| SUPPLY AIR (EACH AIR HANDLING UNIT)                         | TEMP       |
| FAN SYSTEM SPACE  | TEMP       |
| UNITARY HEATERS   | SPACE TEMP |
| MIXED AIR (EACH AIR HANDLING UNIT)                          | TEMP       |
| RETURN AIR (EACH AIR HANDLING UNIT)                         | TEMP       |
| FREEZERS & COOLERS (individual)                             | TEMP       |
| FAN SYSTEM CO2 SENSORS (EACH AIR HANDLING UNIT)             | PPM        |
| BUILDING STATIC   | PRESS      |
| SUPPLY DUCT STATIC (EACH ROOFTOP & AIR HANDLING UNIT)       | PRESS      |
| VAV BOX SENSOR (EACH SENSOR)                                | SPACE TEMP |
| VAV BOX CONTROLLER (EACH CONTROLLER)                        |            |
| CFM, HW VALVE POS., O.A. TEMP. & DISCHARGE AIR TEMPERATURES |            |
| FUTURE USE BY OWNER (4 INPUTS)                              |            |

ANALOG OUTPUTS:

|                                 |                   |
|---------------------------------|-------------------|
| FAN SYSTEM HEATING VALVE        | 0-10 VDC OR PWM   |
| FAN SYSTEM COOLING VALVE        | 0-10 VDC OR PWM   |
| FAN SYSTEM OA & RA DAMPERS      | 0-10 VDC OR PWM   |
| BUILDING RELIEF DAMPERS         | 0-10 VDC OR PWM   |
| SUPPLY FAN SPEED                | 0-10 VDC OR PWM   |
| HEATING PUMP SPEED              | 0-10 VDC OR PWM   |
| COOLING TOWER FAN SPEED         | 0-10 VDC OR PWM   |
| UNITARY HEATING VALVES          | 0-10 VDC OR PWM   |
| UNITARY COOLING VALVES          | 0-10 VDC OR PWM   |
| VAV HEATING VALVE OUTPUT        | 0-10 VDC OR FLOAT |
| FUTURE USE BY OWNER (4 OUTPUTS) | 0-10 VDC OR PWM   |

End of Section

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Section 26 5100  
Section 26 5600  
Section 26 9000

Interior and Exterior Building Lighting  
Exterior Area Lighting  
System Commissioning

# Hillcrest Elementary School Replacement

1300 NORTH ECCLES – OGDEN, UTAH

**OWNER**

OGDEN CITY SCHOOL DISTRICT  
1950 MONROE BLVD.  
OGDEN, UTAH

**PROJECT NO.**

VCBO 22785

**DATE**

15 September 2023



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Tax Exemption Certificate  
Copy of Owner's TC-712G Exemption Certificate

#### DIVISION 01

#### GENERAL REQUIREMENTS

Section 01 1000  
Section 01 1900  
Section 01 2600  
Section 01 2900  
Section 01 3100  
Section 01 3300  
Section 01 6000  
Section 01 7300

Summary of Work  
Definitions and Standards  
Contract Modification Procedures  
Payment Procedures  
Project Management and Coordination  
Submittal Procedures  
Product Requirements  
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#### DIVISIONS 02 - 25

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#### DIVISION 26

#### ELECTRICAL

Section 26 0500  
Section 26 2413  
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Electrical General Provisions  
Switchgear and Switchboards  
Service Entrance  
Overcurrent Protective Devices

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Not Used

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## SECTION 26 0500

**R&O CONSTRUCTION (CMGC) HAS PREVIOUSLY PROCURED THE CT/MS AND MDP SWITCHGEAR DUE TO PROJECT SCHEDULE CONSTRAINTS. DIVISION 26 SHALL INCLUDE WITHIN THEIR BID PACKAGE THE RECEIVING AND INSTALLATION OF THE PREVIOUSLY PROCURED CT/MS AND MDP ALONG WITH THE ENTIRETY THE REMAINING GEAR, EQUIPMENT, FEEDERS, AND THE COMPREHENSIVE INSTALLATION OF THE ENTIRE ONE-LINE AND ELECTRICAL INFRASTRUCTURE WITHIN THEIR BID. DIVISION 26 WILL SHOULDER THE RESPONSIBILITY OF BOTH RECEIVING THE ITEMS AND ENSURING THE COMPLETE INSTALLATION OF THE ELECTRICAL SYSTEM, ALONG WITH ALL OTHER NECESSARY PREREQUISITES TO ESTABLISH A FULLY FUNCTIONAL ELECTRICAL SYSTEM**

### ELECTRICAL GENERAL PROVISIONS

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Architectural, Structural, Mechanical and other applicable documents are considered a part of the electrical documents insofar as they apply as if referred to in full.

##### 1.2 DESCRIPTION OF WORK:

- A. The extent of electrical work is indicated on drawings and/or specified in Divisions 26, 27 and 28 sections of the specification. Provide all labor, materials, equipment, supervision and service necessary for a complete electrical system. Work includes, but is not necessarily limited to, the following items.

| <u>ITEM</u>  | <u>SECTION</u> |
|--|----------------|
| 1. Electrical General Provisions                       | 26 0500        |
| 2. Mechanical and Electrical Coordination              | 26 0501        |
| 3. Electrical Submittals O & M Manuals and Spare Parts | 26 0502        |
| 4. Electrical Connections for Equipment                | 26 0507        |
| 5. Elevator Electrical Requirements                    | 26 0510        |
| 6. Conductors and Cables                               | 26 0519        |
| 7. Grounding   | 26 0526        |
| 8. Supporting Devices                                  | 26 0529        |
| 9. Conduit Raceway                                     | 26 0532        |
| 10. Electrical Boxes and Fittings                      | 26 0533        |
| 11. Raceway Systems                                    | 26 0536        |
| 12. Electrical Seismic Control                         | 26 0548        |
| 13. Electrical Identification                          | 26 0553        |
| 14. Protective Device Study                            | 26 0573        |
| 15. Occupancy Sensors                                  | 26 0923        |
| 16. Lighting Control Equipment                         | 26 0943        |
| 17. Energy & Power Metering System                     | 26 1010        |
| 18. Transformers                                       | 26 2200        |
| 19. Switchgear and Switchboards                        | 26 2413        |

|     |   |         |
|-----|---|---------|
| 20. | Panelboards   | 26 2416 |
| 21. | Service Entrance  | 26 2713 |
| 22. | Wiring Devices  | 26 2726 |
| 23. | Overcurrent Protective Devices  | 26 2815 |
| 24. | Motor and Circuit Disconnects   | 26 2816 |
| 25. | Motor Starters  | 26 2913 |
| 26. | Turnkey Photovoltaic (PV) Renewable Energy System                               | 26 3100 |
| 27. | Emergency Electrical Systems  | 26 3213 |
| 28. | Power Conditioning Systems  | 26 3533 |
| 29. | Surge Protective Devices (SPD)  | 26 4313 |
| 30. | Interior and Exterior Building Lighting   | 26 5100 |
| 31. | Exterior Area Lighting  | 26 5600 |
| 32. | System Commissioning  | 26 9000 |
| 33. | Telephone/Data Systems  | 27 1500 |
| 34. | Audiovisual Systems   | 27 4100 |
| 35. | Intercommunication Systems  | 27 5123 |
| 36. | Public Safety DAS/ERRCS   | 27 5320 |
| 37. | Intrusion Detection Systems   | 28 1600 |
| 38. | Access Control System   | 28 2205 |
| 39. | IP Video Surveillance System  | 28 2300 |
| 40. | Fire Alarm and Detection System   | 28 3111 |
| 41. | Appendix A – OSD Hillcrest ES Public Safety DAS/ERRCS System Preliminary Design |         |

- B. Use of standard industry symbols together with the special symbols, notes, and instructions indicated on the drawings describe the work, materials, apparatus and systems required as a portion of this work.
- C. Visit the site during the bidding period to determine existing conditions affecting electrical and other work. All costs arising from site conditions and/or preparation shall be included in the base bid. No additional charges will be allowed due to inadequate site inspection.

### 1.3 DEFINITION OF TERMS:

- A. The following terms used in Divisions 26, 27 and 28 documents are defined as follows:
  - 1. "Provide": Means furnish, install and connect, unless otherwise indicated.
  - 2. "Furnish": Means purchase and deliver to project site.
  - 3. "Install": Means to physically install the items in-place.
  - 4. "Connect": Means make final electrical connections for a complete operating piece of equipment.

### 1.4 RELATED SECTIONS:

- A. Consult all other sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.
- B. General and Supplementary Conditions: Drawings and general provisions of contract and Division 1 of the Specifications, apply to all Division 26, 27 and 28 sections.
- C. Earthwork:

1. Provide trenching, backfilling, boring and soil compaction as required for the installation of underground conduit, buried cable, in-grade pull boxes, manholes, lighting pole foundations, etc. See Division 31, Sitework, and other portions of Divisions 26, 27 and 28, for material and installation requirements.
- D. Concrete Work:
  1. Provide forming, steel bar reinforcing, cast-in-place concrete, finishing and grouting as required for underground conduit encasement, light pole foundations, pull box slabs, vaults, equipment pads, etc. See Division 3, Concrete for material and installation requirements.
- E. Miscellaneous Metal Work:
  1. Provide fittings, brackets, backing, supports, rods, welding and pipe as required for support and bracing of raceways, lighting fixtures, panelboards, distribution boards, switchboards, motor controls centers, etc. See Division 5, Metals for material and installation requirements.
- F. Miscellaneous Lumber and Framing Work:
  1. Provide wood grounds, nailers, blocking, fasteners, and anchorage for support of electrical materials and equipment. See Division 6, Rough Carpentry for material and installation requirements.
- G. Moisture Protection:
  1. Provide membrane clamps, sheet metal flashing, counter flashing, caulking and sealants as required for waterproofing of conduit penetrations and sealing penetrations in or through fire walls, floors and ceiling slabs and foundation walls. All penetrations through vapor barriers at slabs on grade shall be taped and made vapor tight. See Division 7, Thermal and Moisture Protection for material and installation requirements.
- H. Access panels and doors:
  1. Provide in walls, ceiling, and floors for access to electrical devices and equipment. See Division 8, Doors and Windows for material and installation requirements.
- I. Painting:
  1. Provide surface preparation, priming and finish coating as required for electrical cabinets, exposed conduit, pull and junction boxes, poles, surface metal raceways, etc. See Division 9, Finishes for material and installation requirements.

**1.5 WORK FURNISHED AND INSTALLED UNDER ANOTHER SECTION REQUIRING CONNECTIONS UNDER THIS SECTION:**

- A. Provide electrical service, make requisite connections and perform operational test. Items furnished and installed under other sections and connected under this section, include but are not limited to the following:
  1. Electric motors.
  2. Package mechanical equipment: fans, fan coil units, pumps, boilers, duplex compressors, etc.
  3. Flow switches and valve monitors.
  4. Motorized dampers.
  5. Fire and smoke dampers
  6. Duct mounted smoke detectors.
  7. Elevator/Escalator Controllers.
  8. Irrigation controllers.



9. Door hold-open/release devices.
10. Motorized projection screens.
11. Wheel chair lifts.
12. Roll down doors.
13. Electric hardware.
14. Temperature control panels.
15. Variable frequency controllers.
16. Chiller starters.
17. Motorized Chalkboards/Markerboards/Whiteboards.
18. Display cases.
19. Water coolers.
20. Kitchen equipment including ovens, fryers, mixers, disposers, dishwashers, etc.
21. Fire sprinkler alarm bells.
22. Electric heat trace cable for domestic and industrial hot water piping systems.
23. Electric heat trace cable for guttering, drain lines, etc.
24. Anti-sweat heaters, fan coils, etc. for walk-in coolers and freezers.
25. Hand dryers, hair dryers.
26. Systems/Open Office Furniture

**1.6 ITEMS FURNISHED UNDER ANOTHER DIVISION, BUT INSTALLED AND CONNECTED UNDER THIS DIVISION:**

- A. Items furnished under other Divisions, but turned over to Division 26 for installation and final connection include, but are not necessarily limited to, the following:
  1. Wall mounted control stations for motorized roll-up doors/grills.
  2. Wall mounted control stations for motorized projection screens.
  3. Wall mounted control stations for handicap lift.
  4. Lighting fixtures for kitchen hoods.
  5. Lighting fixtures for walk-in freezers and coolers.

**1.7 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS:**

- A. Before bidding, Contractor shall familiarize himself with the drawings, specifications and project site. Submit requests for clarification to Architect/Engineer in writing prior to issuance of final addendum. After signing the contract, the Contractor shall meet the intent, purpose, and function of the Contract Documents. Any costs of materials, labor and equipment arising therefrom, to make each system complete and operable, is the responsibility of the Contractor.

**1.8 QUALITY ASSURANCE:**

- A. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies refers to the latest edition of such publications adopted and published prior to submittal of the bid proposed, unless noted otherwise herein. Such codes or standards are considered a part of this specification as though fully repeated herein.
- B. When codes, standards, regulations, etc. allow work of lesser quality or extent than is specified under this Division, nothing in said codes shall be construed or inferred as reducing the quality, requirements or extent of the Drawings and Specifications. Perform work in accordance with applicable requirements of all governing codes, rules and

regulations including the following minimum standards, whether statutory or not:

1. National Electric Code (NEC).
  2. International Building Code (IBC).
  3. International Fire Code (IFC).
  4. International Mechanical Code (IMC).
- C. Standards: Comply with the following standards where applicable for equipment and materials specified under this Division.
1. UL Underwriters' Laboratories
  2. ASTM American Society for Testing Materials
  3. CBN Certified Ballast Manufacturers
  4. IPCEA Insulated Power Cable Engineers Association
  5. NEMA National Electrical Manufacturer's Association
  6. ANSI American National Standards Institute
  7. ETL Electrical Testing Laboratories
- D. All electrical apparatus furnished under this Section shall conform to (NEMA) standards and the NEC and bear the Underwriters' Laboratories (UL) label where such label is applicable.
- E. Comply with requirements of State and Local Ordinances. If a conflict occurs between these requirements and the Contract Documents, the most stringent requirements shall govern. The Contractor accepts this responsibility upon submitting his bid, and no extra charge will be allowed after the contract is awarded. This shall not be construed as relieving the Contractor from complying with any requirements of the Contract Documents that may be in excess of the aforementioned requirements, and not contrary to same.
- F. Obtain all permits, inspections, etc. required by authority having jurisdiction. Include all fees in bid. Furnish a certificate of approval to the Owner's Representative from the Inspection Authority at completion of the work.
- G. Employ only qualified craftsmen with at least three years of experience. Workmanship shall be neat, have a good mechanical appearance and conform to best electrical construction practices. Provide a competent superintendent to direct the work at all times. Any person found incompetent shall be discharged from the project and replaced by satisfactory personnel.
- H. Contractor shall have a current state contracting license applicable to type of work to be performed under this contract.
- I. Required Pre-Electrical Construction Meeting with Electrical Engineer: Electrical contractor/representative will be required to attend a pre-electrical construction meeting (approximately 30-60 minutes) with engineering representative in the electrical engineer's office prior to electrical construction commencement. This meeting will address any questions on the part of the contractor and the expectations of the Engineer with regard to specifications, plans and site visits for both rough and finish electrical work.

## **1.9 CONSTRUCTION CHANGE ORDER PROPOSALS**

- A. In the event that a submission of a change order is issued by the contractor, the following information will be required to be submitted by the contractor, prior to any consideration by the owner/architect.
- a. All equipment, including conduit and wire, shall be itemized, identifying unit costs and quantities of equipment. Distributor quotes shall accompany all change order requests. The distributor quotes shall

- include costs for all equipment including conduit and wire. Lot pricing for equipment is not acceptable.
- b. The general contractor shall review and confirm that the quantity and costs of materials submitted appear reasonable for the scope proposed.
  - c. Labor units shall not exceed base NECA #1 standards. No adjustment factors shall be approved.
  - d. Any research and labeling time, shall be the responsibility of the electrical contractor and shall not be included in the change order request.
  - e. Any costs associated with the purchase of tools or transportation shall be fully itemized for review by architect/owner.
  - f. Overtime rates shall only be approved where additional manpower cannot achieve the same result.
  - g. Change order form shall follow the following format:
    - i. PCO number
    - ii. Detailed description of work being performed
    - iii. Location on project where work is performed
    - iv. Chosen NECA column
    - v. Identified material:
      1. QTY
      2. Unit cost
      3. Mark up
      4. Material total
    - vi. Identified labor:
      1. QTY
      2. Unit cost
      3. Composite labor rate
      4. Labor total

#### **1.10 RECORD DRAWINGS:**

- A. Maintain, on a daily basis, a complete set of "Record Drawings", reflecting an accurate record of work in accordance with the following:
  1. Show the complete routing and location of all feeders rated 100 amps and larger. Locate work buried below grade or under slab, work concealed above ceilings, and work in concealed spaces, dimensionally from fixed structural elements (not partition walls, etc.)
  2. Show the complete routing and location of all telecommunications conduits, systems raceways, and empty raceways, 1-1/4" and larger. Locate work buried below grade or under slab, work concealed above ceilings, and work in concealed spaces, dimensionally from fixed structural elements (not partition walls, etc.).
  3. Show all changes, deviations, addendum items, change orders, job instructions, etc., that change the work from that shown on the contract documents, including wall relocations, fixtures and device changes, branch circuiting changes, etc. Where locations of boxes, raceways, equipment, etc. are adjusted in the field to fit conditions, but such new locations may not be obvious by referring to the contract document, show new locations on the record drawings.
- B. At the discretion of the Architect/Engineer, the drawings will be reviewed on a periodic basis and used as a pre-requisite for progress payments. This requirement shall not be construed as authorization for the Contractor to make changes in the layout, or work without written authorization for such changes. The "Record Drawings" for daily recording shall consist of a set of blue line prints of the Contract Drawings.
- C. Upon completion of the work, purchase a complete set of electronic drawings. Transfer

all "Record" information from the blue line prints to the drawings via the current CAD program that it was written. The Architect/Engineer shall review the drawings and the Contractor shall incorporate the resulting comments into the final record drawings. The Contractor shall make two complete copies of the drawings electronically and forward this to the Engineer.

- D. Certify the "Record Drawings" for correctness by placing and signing the following certifications of the first sheet of the drawings:

"CERTIFIED CORRECT (3/8" high letters)

(Name of General Contractor)

By: \_\_\_\_\_ Date: \_\_\_\_\_

(Name of Electrical Contractor)

By: \_\_\_\_\_ Date: \_\_\_\_\_

**1.11 GUARANTEE:**

- A. Ensure that electrical system installed under this contract is in proper working order and in compliance with drawings, specifications, and/or authorized changes. Without additional charge, replace any work or materials that develop defect, except from ordinary wear and tear, within one year from the date of substantial completion. Exception: Incandescent and fluorescent lamps shall be guaranteed for a period of two months from the date of substantial completion.

**1.12 OTHER:**

- A. Right to Hire. "Client" agrees that during the project and for a period of twenty four (24) months following substantial completion that it will not, directly or indirectly, employ or solicit to employ BNA Personnel.

**PART 2 – PRODUCTS**

**2.1 GENERAL:**

- A. Products are specified by manufacturer name, description, and/or catalog number. Discrepancies between equipment specified and the intended function of equipment shall be brought to the attention of the Architect/Engineer in writing prior to bidding. Failure to report any conflict, including catalog numbers, discontinued products, etc., does not relieve the Contractor from meeting the intent of the contract documents nor shall it change the contract cost. If the Contractor is unable to interpret any part of the plans and/or specifications, or should he find discrepancies therein, he shall bring this to the attention of the Architect/Engineer who will issue interpretation and/or additional instructions to Bidders before the project is bid.

**2.2 MANUFACTURERS:**

- A. Provide products of manufacturers specified. Manufacturers catalog numbers and descriptions establish the quality of product required. Substitutions will be considered if a duplicate written application (2-copies) is at the office of the Architect/Engineer eight (8) working days prior to the day of the bidding. The application shall include the following: 1) A statement certifying that the equipment proposed is equal to that specified; that it has the same electrical and physical characteristics, compatible

dimensions, and meets the functional intent of the contract documents; 2) The specified and submittal catalog numbers of the equipment under consideration; 3) A pictorial and specification brochure.

- B. Any conflict arising from the use of substituted equipment shall be the responsibility of the Contractor, who shall bear all costs required to make the equipment comply with the intent of the contract documents.
- C. Samples may be required for non-standard or substituted items before installation during construction. Provide all samples as required.
- D. No materials or apparatus may be substituted after the bid opening except where the equipment specified has been discontinued.
- E. Provide only equipment specified in the Contract Documents or approved by addendum.

### **2.3 SPARE PARTS:**

- A. Provide spare parts (fuses, diffusers, lamps, etc.) as specified. Transmit all spare parts to Owner's Representative prior to substantial completion.

## **PART 3 – EXECUTION**

### **3.1 INSTALLATION:**

- A. Layout electrical work in advance of construction to eliminate unnecessary cutting, drilling, channeling, etc. Where such cutting, drilling, or channeling becomes necessary for proper installation; perform with care. Use skilled mechanics of the trades involved. Repair damage to building and equipment at no additional cost to the contract. Cutting work of other Contractors shall be done only with the consent of that Contractor. Cutting structural members shall not be permitted.
- B. Since the drawings of floor, wall, and ceiling installation are made at small scale; outlets, devices, equipment, etc., are indicated only in their approximate location unless dimensioned. Locate outlets and apparatus symmetrically on floors, walls and ceilings where not dimensioned, and coordinate such locations with work of other trades to prevent interferences. Verify all dimensions on the job. Do not scale the electrical drawings, but refer to the architectural and mechanical shop drawings and project drawings for dimensions as applicable.
- C. Perform for other trades, the electrical wiring and connection for all devices, equipment or apparatus. Consult Architectural, Mechanical, and other applicable drawings, and all applicable shop drawings to avoid switches, outlets, and other equipment from being hidden behind doors, cabinets, counters, heating equipment, etc., or from being located in chalkboards, tackboards, glass panels, etc. Relocate buried electrical devices and/or connections as directed at no additional cost.
- D. Coordinate the location of outlets, devices, connections, and equipment with the supplier of the systems furniture prior to rough-in.
- E. Where conduit, outlets or apparatus are to be encased in concrete, it must be located and secured by a journeyman or foreman present at the point of installation. Check locations of the electrical items before and after concrete and/or masonry installation and relocate displaced items.
- F. Provide block-outs, sleeves, demolition work, etc., required for installation of work specified in this division.

### **3.2 CLEAN:**

- A. Clean up all equipment, conduit, fittings, packing cartons and other debris that is a direct result of the installation of the work of this Division.
- B. Clean fixtures, interiors and exteriors of all equipment, and raceways. Replace all filters in electrical equipment upon request for Substantial Completion.

### **3.3 POWER OUTAGES:**

- A. All power outages required for execution of this work shall occur during non-standard working hours and at the convenience of the Owner. Include all costs for overtime work in bid.
- B. Submit written request at least 7 days in advance of scheduled outage and proceed with outage only after receiving authorization from the Owner's Representative.
- C. Keep all outages to an absolute minimum.

### **3.4 STORAGE AND PROTECTION OF MATERIALS:**

- A. Provide storage space for storage of materials and apparatus and assume complete responsibility for all losses due to any cause whatsoever. In no case shall storage interfere with traffic conditions in any public thoroughfare or constitute a hazard to persons in the vicinity. Protect completed work, work underway, and apparatus against loss or damage.

### **3.5 EXCAVATING FOR ELECTRICAL WORK:**

- A. General: Locate and protect existing utilities and other underground work in manner that will ensure that no damage or service interruption will result from excavating and backfilling. Perform excavation in a manner that protects walls, footings, and other structural members from being disturbed or damaged in any way. Burial depths must comply with NEC Section 300-5 (or State of Utah requirement, whichever is more stringent), unless noted otherwise on drawings.
- B. Protect persons from injury at excavations, by barricades, warnings and illumination.
- C. Coordinate excavations with weather conditions, to minimize possibility of washouts, settlements and other damages and hazards.
- D. Provide temporary covering or enclosure and temporary heat as necessary to protect bottoms of excavations from freezing and frost action. Do not install electrical work on frozen excavation bases or sub-bases.
- E. Do not excavate for electrical work until the work is ready to proceed without delay, so that total time lapse from excavation to completion of backfilling will be minimum. See other sections of specification for additional requirements for excavating.
- F. Store excavated material (temporarily) near excavation, in a manner that will not interfere with or damage excavation or other work. Do not store under trees (within drip line).
- G. Retain excavated material that complies with requirements for backfill material. Dispose of excavated material that is either in excess of quantity needed for backfilling or does not comply with requirements for backfill material. Remove unused material from project site, and dispose of in lawful manner.

### **3.6 BACKFILL MATERIALS:**

- A. For buried conduit or cable (other than below slab-on-grade, or concrete encased) - 2"

thickness of well graded sand on all side of conduit or cable.

- B. For trench backfill to within 6" of final grade - soil material suitable for compacting to required densities.
- C. For top 6" of excavation - Top soil.
- D. Backfill excavations in 8" high courses of backfill material, uniformly compacted to the following densities (percent of maximum density, ASTM D 1557), using power-driven hand-operated compaction equipment.
  - 1. Lawn/Landscaped Areas: 85 percent for cohesive soils, 95 percent for cohesionless soils.
  - 2. Paved Areas, Other than Roadways (90 percent for cohesive soils, 95 percent for cohesionless soils).
- E. Subsidence: Where subsidence is measurable or observable at electrical work excavations during general project warranty period, remove surface (pavement, lawn or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality and condition of the surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

### **3.7 UTILITY COORDINATION:**

- A. Coordinate closely with Rocky Mountain Power (RMP) to finalize the conduit routing shown on the site plan. Verify all equipment dimensions and locations before beginning rough in. Consult all applicable contract drawings and latest RMP ESR to insure RMP code clearances required around all electrical equipment, trenching and burial depths, and identification requirements are met. Adjust locations of electrical work, boxes, outlets etc. As necessary to avoid obstructing electrical equipment or building appurtenances. Where job conditions require changes from the contract documents that do not change the scope of installation or nature of work required, the contractor will make such changes without additional cost to the owner. No other changes may be made without written permission of the owner.
- B. Submit metering, main breaker, switchgear for approval prior to preconstruction.
- C. Contractor to verify all phasing, voltages, and connections prior to energizing of electrical equipment.

### **1.1 CONCRETE BASES:**

- A. Unless otherwise noted, provide 4" high reinforced concrete bases for all floor mounted or floor standing electrical equipment, including generators, transformers, switchgear, battery racks, motor control centers, etc. Extend bases 6" beyond equipment or mounting rails on all sides or as shown on the drawings. Notwithstanding this requirement, coordinate with equipment manufacturer, shop drawings, and height of base to ensure compliance with NEC 404.8.
- B. Concrete bases shall be provided under Divisions 26, 27 and 28. Coordinate size and location of all bases and furnish all required anchor bolts, sleeves, reinforcing and templates as required to obtain a proper installation.
- C. Provide and locate properly sized concrete pads for power company furnished pad mounted transformers in accordance with power company clearance requirements. Where the serving utility is Rocky Mountain Power, the electrical contractor shall conform to the requirements of Electrical Service Requirements, Section 6.4.

### **1.2 ROOF PENETRATIONS:**

- A. Where raceways penetrate roofing or similar structural area, provide appropriate roof

jack coordinate with the roofing contractor and the Architect in order to match the vent with the roof construction. The jack shall be sized to fit tightly to raceway for weather-tight seal, and with flange extending a minimum of 9" under roofing in all sides or as required by the roof type of construction. Completely seal opening between inside diameter of roof flashing and outside diameter of penetrating raceways. Coordinate all work with work required under roofing section of specifications.

**1.3 FIRE PENETRATION SEALS:**

- A. Seal all penetrations for work of this section through fire rated floors, walls and ceilings to prevent the spread of smoke, fire, toxic gas or water through the penetration either before, during or after fire. The fire rating of the penetration seal shall be at least that of the floor, wall or ceiling that it is installed, so that the original fire rating of the floor or wall is maintained as required by Article 300-21 of the National Electrical Code. Where applicable, provide OZ Type CFSF/I and CAFSF/I fire seal fittings for conduit and cable penetrations through concrete and masonry walls, floors, slabs, and similar structures. Where applicable, provide 3M CID cast-in device for floor slabs. Where applicable, provide 3M fire barrier sealing penetration system, and/or IPC Flame Safe Fire Stop System, and/or Chase Foam fire stop system, including wall wrap, partitions, caps, and other accessories as required. All materials to comply with UL 1479 (ASTM E-814). Comply with manufacturer's instructions and recommendations for installation of sealing fittings and barrier sealing systems.

**1.4 PROJECT FINALIZATION AND START-UP:**

- A. Upon completion of equipment and system installation, assemble all equipment Factory Representatives and Subcontractors for system start-up.
- B. Each Representative and Subcontractor shall assist in start-up and check out their respective system and remain at the site until the total system operation is accepted by the Owner's representative.
- C. The Factory Representative and/or System Subcontractor shall give personal instruction on operating and maintenance of their equipment to the Owner's maintenance and/or operation personnel. To certify acceptance of operation and instruction by the Owner's Representative, the contractor shall prepare a written statement as follows:
  - 1. This is to certify that the Factory Representative and System Subcontractor for each of the systems listed below have performed start-up and final check out of their respective systems.
  - 2. The Owner's Representative has received complete and thorough instruction in the operation and maintenance of each system.

|                                   |   |
|-----------------------------------|---|
| SYSTEM<br>(List systems included) | FACTORY REPRESENTATIVE<br>(List name and address of Factory Representative) |
|-----------------------------------|---|

---

|                        |            |
|------------------------|------------|
| Owner's Representative | Contractor |
|------------------------|------------|

- D. Send copy of acceptance to Architect/Engineer.

**1.5 FINAL REVIEW:**

- A. At the time of final review, the project foreman shall accompany the reviewing party, and remove coverplates, panel covers and other access panels as requested, to allow review of the entire electrical system.



**END OF SECTION 26 0500**

## SECTION 26 0501

### MECHANICAL / ELECTRICAL & OWNER PROVIDED EQUIPMENT COORDINATION

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Architectural, Structural, Vertical Transportation, Mechanical and other applicable documents are considered a part of the electrical documents insofar as they apply as if referred to in full. Contractor must review the entire set of plans and specifications. Reviewing only the electrical set is not acceptable.

##### 1.2 CONTRACTOR RESPONSIBILITIES

- A. Electrical Contractor shall verify electrical service provided prior to ordering any electrical equipment serving owner-provided equipment / mechanical equipment, and Electrical Contractor shall have the final responsibility for properly coordinating the electrical work, including the exact location, quantity and sizes of the electrical connection(s).
  - 1. Circuit breakers, disconnects, starters, fuses, conduit sizes, wire sizes, VFDs, etc. have been coordinated by Engineers and sized according to the mechanical systems “Basis of Design”. Coordinate with Division 23 Contractor for any changes arising from substituted equipment or changes to the basis of design in any way. Coordinate all requirements of multi-motor VFD control (including fanwall units) and ensure all provisions accordingly. Prepare documentation showing changes in the electrical characteristics of each piece of equipment that has changed and submit for acceptance. All costs arising from said changes shall be the responsibility of Division 23.
  - 2. Circuit breakers, disconnects, starters, fuses, conduit sizes, wire sizes, VFDs, etc. have been coordinated by Engineers and sized according to the owner-provided equipment for the shop (Kilns, compressors, dust collectors, welders, plasma cutters, shop equipment, etc.) as a “Basis of Design”. Coordinate with Owner for any changes arising from substituted equipment or changes to the basis of design in any way. Prepare documentation showing changes in the electrical characteristics of each piece of equipment that has changed and submit for acceptance. Organize meeting with Owner representatives to finalize location and services.
- B. Division-26 is responsible to provide conduit and rough-in for all thermostat controls located within walls. Refer division 21-23 drawings and coordinate with Controls Contractor to verify exact location of all thermostats. Obtain and review submittals of Temperature Control Equipment from Controls Contractor and Divisions 21-23
- C. Obtain submittals of all mechanical equipment from Division 21 through 23 contractor(s) as they are submitted to the design team.
  - 1. Notify engineer of any modifications between contract documents and submittals. It shall be the contractor’s responsibility to ensure compliance with the documents.
- D. Obtain submittals of all owner-provided equipment from Owner Representative prior to rough-in. It is not acceptable to proceed with the rough-in phase of work until this has been completed—if contractor elects to proceed they do at their own risk.
  - 1. Notify engineer of any modifications between contract documents and submittals.

It shall be the contractor's responsibility to ensure compliance with the documents.

- E. Electrical contractor shall be responsible for coordinating all their own blockouts and coordinating their space of a shared blockout.
- F. Coordinate all interfaces between Mechanical and Electrical/Communications/Security Divisions before submitting any equipment for review or beginning installation.

**1.3 ABBREVIATIONS**

- A. MC: Mechanical Contractor = Divisions 21 through 23 Contractor who provides equipment and motor.
- B. TC: Temperature Controls = Division 25 1000 Contractor who provides control.
- C. EC: Electrical Contractor = Divisions 26 through 28 Contractor who provides power/data.
- D. FA: Fire Alarm Contractor = Division 28 Contractor who furnishes Fire Alarm System.

**1.4 RESPONSIBILITY SCHEDULE**

- A. Responsibility: Unless otherwise indicated, all equipment, motors, and controls for Divisions 21 through 23 equipment shall be furnished, set in place and wired in accordance with the following schedule:

| ITEM -   | Furnished Under | Set In Place Under | Power Wiring Under | Control Wiring Under |
|--|-----------------|--------------------|--------------------|----------------------|
| AHU Interior Lights (Note 8)                                       | MC              | MC                 | MC                 | MC                   |
| AHU Light Switch   | EC              | EC                 | EC                 | EC                   |
| RTU Light Switch   | MC              | MC                 | EC                 | EC                   |
| Equipment Motors   | MC              | MC                 | EC                 | TC                   |
| Automatically or Manually Controlled Starters/Contactors: (Note 4) |                 |                    |                    |                      |
| -Separate  | EC              | EC                 | EC                 | TC                   |
| -Factory Mounted and Wired   | MC              | MC                 | EC                 | TC                   |
| Variable Frequency Drives  |                 |                    |                    |                      |
| -Separate  | MC              | EC                 | EC                 | TC                   |
| -Factory Mounted and Wired   | MC              | MC                 | EC                 | TC                   |
| In Motor Control Centers (Note 4)                                  | EC              | EC                 | EC                 | TC                   |
| Motor Speed Controllers: (Note 4)                                  |                 |                    |                    |                      |
| -Separate  | MC              | EC                 | EC                 | TC                   |
| -Factory Mounted and Wired   | MC              | MC                 | EC                 | TC                   |
| Disconnect Switches (Note 1)                                       | EC              | EC                 | EC                 | --                   |
| Thermal Overload Switches (Note 1)                                 | EC              | EC                 | EC                 | --                   |
| Switches (Manual or Automatic other than disconnect) (Note 2)      | MC or TC        | MC or TC           | EC or TC           | TC or MC             |
| Control Relays (Note 2)  | MC or TC        | MC or TC           | --                 | TC                   |
| Control Transformers   | TC              | MC or TC           | EC (120V)          | TC                   |

| ITEM -  | Furnished Under | Set In Place Under | Power Wiring Under | Control Wiring Under |
|---|-----------------|--------------------|--------------------|----------------------|
| Thermostat and Controls: Integral with Equipment or Directly Attached to Ducts, Pipes, etc. (Note 2)  | TC              | MC or TC           | TC                 | TC                   |
| Equipment in Temperature Control Panels   | TC              | TC                 | EC                 | TC                   |
| Standalone Control Panels (BAS) (Note 6)  | TC              | TC                 | EC (120V)          | TC                   |
| Valve Motors, Damper Motors, Solenoid Valves, etc.  | MC & TC         | MC & TC            | TC                 | TC                   |
| EP Valves or Switches, P.E. Switches, etc.  | TC              | TC                 | --                 | TC                   |
| Fire Alarm System (Note 3)  | FA              | FA                 | EC                 | FA                   |
| Fire Sprinkler Alarm (Note 3)   | FA              | FA                 | EC                 | FA                   |
| Duct System Smoke Detectors (Note 5)  | FA              | MC                 | EC                 | TC/FA                |
| Relays for Fan Control via duct detectors (Note 5)  | MC              | EC                 | EC                 | FA                   |
| Room Smoke Detectors Including Relays for Fan Control (Note 3)  | FA              | EC                 | EC                 | EC                   |
| Smoke Management Curtain and Shutters (Note 6)  |                 |                    | EC                 | EC/FA                |
| CO Sensors  | FA              | FA                 | EC                 | FA                   |
| Equipment Interlocks  | TC              | TC                 | --                 | TC                   |
| Fire/Smoke and Smoke Dampers (Note 7)   | MC              | MC                 | EC                 | FA                   |
| Positive Indication Devices (i.e., current sensors, end switches, airflow sensors)                    | TC              | TC                 | --                 | FA/TC                |
| Freezer and Refrigerator Temperature Controls (Intrusion)   | MC              | MC                 | EC                 | EC                   |
| Domestic Water Flow Switch (Intrusion) Located downstream past the cooling tower. Provide 120V power. | MC              | MC                 | EC                 | EC                   |
| Low Building Temperature Sensor (Intrusion)   | MC              | MC                 | EC                 | EC                   |

B. Responsibility Schedule Notes:

1. If furnished as part of factory wired equipment furnished and set in place by MC, wiring and connections by EC.
2. If float switches, line thermostats, P.E. switches, time switches, or other controls carry the FULL LOAD CURRENT to any motor, they shall be furnished by MC, but they shall be set in place and connected by EC, except that where such items are an integral part of the mechanical equipment, or directly attached to ducts, piping, or other mechanical equipment, they shall be furnished and set in place by MC and connected by EC. If they do not carry the FULL LOAD CURRENT to any motor, they shall be furnished, set in place and wired by TC contractor.
3. Electrical contractor is responsible for wiring from starter to motor, unless factory wired.
4. Temperature control contractor shall provide conduit and wire from auxiliary contact in motor starter to the detector so that the unit shuts down in all operating modes. Fire Alarm Contractor to wire from detector to fire alarm panel.
5. Each division shall be fully responsible for any control panels as called for on the drawings or specifications.

- a. Division 26 and 28 shall provide all power and control wiring to fire/smoke and/or smoke dampers. Division 23 shall provide parallel control wiring (with 28 fire alarm having priority signal) to dampers and equipment utilized in both normal and smoke control modes. Refer to Smoke Control and Fire Alarm Drawings and the Fire Alarm Matrix.
  - b. Fire alarm system shall override automated building control system during smoke exhaust mode.
  - c. TC wiring required only when damper also serves HVAC system.
6. FA wires from the fire alarm control panel necessary for the initiation and monitoring of the Smoke Management System Control Panel. TC wires to components and smoke control fans and dampers utilized in the control and monitoring of the Automated Building Control System.
- a. Provide 120V emergency circuit and fire alarm connections to each curtain and shutter. Coordinate exact locations with curtain and shutter contractor.
7. Division 26 shall provide power to junction box on the exterior of the AHU.
8. Exhaust Fans -Division 26 shall provide power and connection to all exhaust fans:
- a. Exhaust fans utilized for restrooms shall be operate on/off with the local lighting occupancy sensor. Provide pre-wired relay to accept contact from occupancy sensor to exhaust fan operating voltage.
- C. Power Wiring by Divisions 21 through 23: The electrical power for certain equipment provided under Divisions 21 through 23 has not been specifically indicated on the electrical drawings and must be provided by and field coordinated by the Divisions 21 through 23 trades requiring such power. Electrical contractor shall review Division 21 through 23 drawings and coordinate with said contractors to confirm power needs.
- 1. Sufficient power for this purpose shall be furnished as "spare" dedicated circuit capacity in Division 26's panelboards. All wiring, conduit and electrical devices downstream of the panelboards are the responsibility of the Divisions 21 through 23 trades requiring the power.
    - a. Such equipment is hereby defined as:
  - 2. Electrical heat trace. Required heat trace locations, capacities and specification are shown on the plumbing drawings (Division 22 work).
  - 3. Dry-pipe control panels and valves. Required connections are included in the Division 21 work, and will be shown by that contractor's engineered system design drawings.
    - a. Such equipment is hereby defined as:
    - b. Electrical heat trace. Required heat trace locations, capacities and specification are shown on the plumbing drawings (Division 22 work).
    - c. Fire protection air compressors, dry-pipe control panels and valves. Required connections are included in the Division 21 work, and will be shown by that contractor's engineered system design drawings.
    - d. Pre-action system alarm and trouble initiation signals (such as smoke detectors or general alarm conditions in a pre-action zone) shall be provided under Division 28 fire alarm work.
    - e. Division 21 shall provide pre-action control panel and interconnection between pre-action panel and location of pre-action valve(s). See

Specification 21-5000 for FM 200.

- f. Division 28 shall provide interconnection between fire command center alarm panel (provided under Division 28) and remote communication fire alarm panel (provided under Division 28).
4. Infrared plumbing fixtures. Fixtures requiring power are shown on the plumbing drawings and schedules. Provide junction box and or receptacle as required by manufacturer.
5. Temperature control panels, control air compressors and line voltage power for 24v control transformers. Required connections are included in Division 23 09 00 and will be shown by that contractor's control submittal drawings.
6. Condensate pumps. Provide power from associated unit or from nearby panelboard.
7. BAS or Control System Gateways. Provide power from nearest panelboard and single data cable from nearest telecommunications room.

## 1.5 GENERAL REQUIREMENTS

- A. Special Requirements:
  1. Motors, starters and other electrical equipment installed in moist areas or areas of special conditions, such as explosion proof, shall be designed and approved for installation in such areas with appropriate enclosure.
- B. Building Management System Controls:
  1. Provide 120V circuit and single data cable to each building management control panel. Coordinate exact locations with controls contractor. See Specification 27-1500
  2. Low voltage wiring from J-boxes to distributed control components, all low voltage connections, all control panels and all control transformers (not part of unitary equipment) shall be provided under Division 23.
  3. Any additional power requirements shall be the responsibility of the Division 23 Contractor requiring same, and shall be provided at no additional cost to the owner.

## 1.6 CEILING AND CHASE CAVITY PRECEDENCE

- A. Coordinate ceiling cavity space carefully with all trades. In the event of conflict, install mechanical and electric systems within the cavity space allocation in the following order of precedence. A system with higher precedence may direct that systems of lower precedence be relocated from space, which is required for expedient routing of the precedent system.
  1. Plumbing waste, cooling coil drain piping, and roof drain mains and leaders.
  2. Condensate piping.
  3. Hydronic main piping (8" and larger).
  4. Plumbing vent piping.
  5. Supply, return and exhaust ductwork.
  6. Cable tray systems.
  7. Electrical conduit 4" diameter or greater.

8. Hydronic branch and mains (greater than 2", but less than 8").
  9. Domestic water piping.
  10. Fire sprinkler mains and leaders.
  11. Hydronic branch piping (2" and less).
  12. Domestic hot and cold-water branches.
  13. Electrical branch conduits.
  14. Pneumatic control piping.
  15. Fire sprinkler branch piping and sprinkler runouts.
- B. Light fixtures have precedence in a zone, which is the same height above the ceiling as the depth of the fixture (plus 2").
  - C. Examine the contract documents of all trades (e.g. all Divisions 21 through 23 and 26 through 28 drawings, the architectural floor plans, reflected ceiling plans, elevations and sections, structural plans and sections, etc.).
  - D. Coordinate necessary equipment, ductwork and piping locations so that the final installation is compatible with the materials and equipment of the other trades.
  - E. Prepare shop drawings for installation of all new work before installation to verify coordination of work between trades.
  - F. Provide access doors for all electrical and communications equipment which require access for adjustment or servicing and which are in otherwise inaccessible locations. All access door locations must be approved by the architect prior to installation and be in as inconspicuous location as possible.
    1. For equipment located in "accessible locations" such as lay-in ceilings: Locate equipment to provide adequate service clearance for normal maintenance without removing architectural, mechanical, electrical or structural elements such as the ceiling support system, electrical fixtures, etc. "Normal maintenance" includes, but is not limited to: replacement of drivers, fuses, etc.

#### **1.7 BLOCKOUT USAGE**

- A. Electrical and Mechanical Contractors shall review the contract documents and advise if additional blockouts are necessary for the execution of work. Electrical and Mechanical Contractors shall coordinate and hold meetings with other contractors who will occupy the blockouts to ensure sufficient space is allocated for their scope of work. It is not acceptable to delay this meeting until conduit/piping/tray is being installed. Change orders are not acceptable due to a lack of contractor coordination prior to commencing rough in.

#### **PART 2 - PRODUCTS (NOT USED)**

#### **PART 3 - EXECUTION (NOT USED)**

**END OF SECTION 26 0501**





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## SECTION 26 0502

### ELECTRICAL SUBMITTALS AND O & M MANUALS

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to all Division 26, 27 and 28 sections.
- B. Architectural, Structural, Mechanical and other applicable documents are considered a part of the electrical documents insofar as they apply as if referred to in full. Contractor must review the entire set of plans and specifications. Reviewing only the electrical set is not acceptable.
- C. Consult all other sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.

##### 1.2 SUBMITTAL REQUIREMENTS:

###### A. GENERAL:

- 1. After the Contract is awarded but prior to ordering, manufacture, or installation of any equipment, prepare complete Submittals including shop drawings, product data, brochures, etc. for materials and equipment as required by each section of the specification.
- 2. Review of Submittals shall not relieve the Contractor of responsibility for dimensions and/or errors that may be contained therein, or deviations from the Contract Document's requirements. It shall be clearly understood that the noting of some errors but overlooking others does not grant the Contractor permission to proceed in error. Regardless of any information contained in the Shop Drawings and Brochures, the requirements of the Contract Document's shall govern and are not waived, or superseded in any way by the review of the Shop Drawings and Brochures.
- 3. Submittals are reviewed, not approved. Comments made within submittals do not alter the contract documents in any way. The contractor is still responsible, regardless of comments (if any) made within submittals, for complying with drawings and specifications.
- 4. Notify engineer in writing if any of the comments noted in the submittals alter the contract cost. A comment within the submittal process which increases/decreases cost of product is not an authorization to the contractor under any circumstances to proceed.
- 5. Notify engineer of any modifications between contract documents and submittals. It is the responsibility of the contractor to ensure compliance.
- 6. ELECTRONIC SUBMITTAL REQUIREMENTS:
  - a. Provide submittals in Portable Document Format (PDF).
  - b. Documents must be electronically bookmarked and keyword searchable using Adobe Acrobat (<http://www.adobe.com/acrobat>) or Bluebeam Revu (<http://www.bluebeam.com>) for each relevant section. For example, include electronic bookmarks separating "Light Fixtures" from "Panelboards".

- c. Electronically highlight all options for light fixtures, electrical equipment, etc. Manual highlighting and scanning of the documents is NOT acceptable and will NOT be reviewed.
- d. Provide only completed cutsheets for all fixture and equipment types. Blank cutsheets submitted with a schedule are NOT acceptable and will NOT be reviewed.
- e. At the time of submission, the electrical contractor shall provide a complete and comprehensive submission of all required specification sections/shop drawings at the same time. Exceptions may be given, with prior approval, for time-sensitive equipment.
- f. A maximum of one submittal per specification section is allowed. It is NOT acceptable to provide a product by product submittal. Single product by product submittals will NOT be reviewed.

**B. SCHEDULING**

**1. GENERAL**

- a. A minimum period of two weeks, exclusive of transmittal time, will be required each time Submittals are submitted or resubmitted for review. This time period shall be considered by the Contractor when scheduling submittal data.
- b. If the shop drawings are rejected twice, the contractor shall reimburse the engineer the sum of \$1,200.00 for the third review and any additional reviews required prior to commencement of the third review.

**C. QUALITY ASSURANCE**

**1. PRE-SUBMITTAL PREPARATION**

- a. Prior to submission of the Shop Drawings and Project Data, review and certify that they are in compliance with the Contract Documents. Verify all dimensional information to ensure proper clearance for installation of equipment.
- b. Shop drawings requiring the use of electronic documents (floor plans, Lighting plans, fire alarm plans, etc.) shall be requested via a request for information (RFI) through the general contractor. Electronic documents will be provided to the Architect for distribution. No direct vendor requests will be accepted.
- c. Contractor is completely responsible for the content of the submittal

**2. SUBMITTAL REQUIREMENTS**

- a. Certifications shall be written or in the form of rubber stamp impressions as follows:
  - i. I hereby certify that this Shop Drawing and/or Brochure has been checked prior to submittal and that it complies in all respects with the requirements of the Contract Drawings and Specifications for this Project.

(Name of Electrical Subcontractor)

Name \_\_\_\_\_.

Position \_\_\_\_\_ Date \_\_\_\_\_.

- b. Brochures to be submitted shall be published by the Manufacturers and shall contain complete and detailed engineering and dimensional information. Brochures submitted shall contain only information relevant to the particular equipment or materials to be furnished. The Contractor shall

not submit catalogs that describe several different items in addition to those items to be used, unless all irrelevant information is marked out, or unless relevant information is clearly marked. Brochures from each manufacturer shall be identified and submitted separately.

- c. Shop Drawings shall be done in an easily legible scale and shall contain sufficient plans, elevations, sections, and isometrics to clearly describe the equipment or apparatus, and its location. Drawings shall be prepared by an Engineer/Draftsmen skilled in this type of work. Shop Drawings shall be drawn to at least 1/4" = 1'0" scale.
- d. Observe the following rules when submitting the Shop Drawings and Brochures.

- i. Each Shop Drawing shall indicate in the lower right hand corner, and each Brochure shall indicate on the front cover the following: Title of the sheet or brochure, name and location of the building; names of the Architect and Electrical Engineer, Contractor, Subcontractors, Manufacturer, Supplier/Vendor, etc., date of submittal, and the date of correction and revision. Unless the above information is included the submittal will be returned for resubmittal.

1. Submittal Identification shall include the following:

- a. A unique number, sequentially assigned, shall be noted on the transmittal form accompanying each item submitted.
- b. Original submittal numbers shall have the following format: "XXX-Y;" where "XXX" is the originally assigned submittal number and "Y" is a sequential letter assigned for resubmittals (for example, A, B, or C being the first, second, and third resubmittals, respectively). Submittal 25B, for example, is the second resubmittal of Submittal 25.

- e. SPECIFICATION section and paragraph to which submittal applies.

D. POST-SUBMITTAL

- 1. Check all materials and equipment after arrival on the job site and verify compliance with the Contract Documents.

**1.3 PROVIDE SUBMITTALS AS REQUESTED FOR EACH OF THE SECTIONS LISTED BELOW:**

A. 26 0519 Conductors and Cables

- 1. (600V and Below)

- a. Submit megohmmeter test data for circuits under 600 volts.

- 2. Conductors and Cables (Medium and Low Voltage)

- a. Submit manufacturer's data on electrical cable and connectors for use above 600 volts. Upon request of Architect/Engineer, submit certificate of compliance indicating that cable has been tested in accordance with ICEA S-68-516, AE16 #6 and UL Standard 1072, and meets or exceeds minimum requirements.

- b. Submit test data in accordance with IEEE Standard 400-2001 showing ambient conditions, voltage levels, level durations, and conduction current for each step. Include effective insulation resistance in submittal.
    - c. Submit medium voltage cable Splicer/Terminator certification of competency and experience 20 days before splices or terminations are made in medium voltage cables. Splicer/Terminator experience during the immediate past 3 years shall include performance in splicing and terminating cables of the type and classification being provided under this contract.
- B. 26 0526 Grounding
  - 1. Submit the name of test agency to be used for testing specified in this section. Submit results of tests specified in this section. Also include test results in Operation and Maintenance Manuals as specified.
- C. 26 0532 Conduit Raceway
  - 1. Submit manufacturer's data on Power & Control/Signal Cable.
- D. 26 0533 Electrical Boxes and Fittings
  - 1. Submit manufacturer's data including specifications, installation instruction and general recommendations for each type of floor box used on project.
- E. 26 0536 Raceway Systems
  - 1. Submit manufacturer's data including specifications, installation instructions and general recommendations, for each type of raceway as follows: Surface Metal Raceways, Cable Tray Systems, Overhead metal raceways, Wire basket cable tray systems
  - 2. Submit dimensioned drawings of raceway systems showing layout of raceways and fittings, spatial relationships to associated equipment, and adjoining raceways, for each type of raceway as follows: Surface metal Raceways, Cable Tray Systems, Overhead metal raceways, Wire basket cable tray systems
- F. 26 0548 Electrical Seismic Control
  - 1. A single submittal shall be provided for all seismic anchorage and restraints for all Division 26 equipment and systems provided as part of this project. Individual submittals for specific systems will not be accepted.
  - 2. Submit shop drawings, calculations, and printed data for the following items under provisions of the General Conditions of the Contract:
    - a. Complete engineering calculations and shop drawings for all seismic requirements for all equipment to be restrained as outlined in Section 26 0548 Specification, and as detailed on drawings.
    - b. The professional seal of the engineer who is responsible for the design of the Seismic Restraint System.
    - c. Details for all seismic bracing.
    - d. Details for steel frames, concrete inertia bases, and housekeeping pads. Include dimensions, embed depths, dowelling details, and concrete reinforcing requirements.
    - e. Clearly outlined procedures for installing and adjusting the isolators, seismic bracing anchors, snubbers, cables, and bolt connections.
    - f. Floor plan noting the locations, size, and type of anchorage and restraint to be used.

- g. Include confirmation that all calculations are based on the design criteria listed in appropriate Section.
  - h. Certificate of Compliance.
  - i. Where equipment is exempt per this specification provide a written certificate of compliance for each of the systems noted with the professional seal of engineer who has reviewed the electrical system.
- G. 26 0553 Electrical Identification
- 1. Submit manufacturer's data on each type of electrical identification products
    - a. Submit one sample of each component of the electrical identification system as follows: Wire/cable tape marker, Tags, Engraved, plastic laminate labels, Arc-flash hazard labels
- H. 26 0573 Protective Device Study
- 1. Submit partial study that includes the calculated values for short circuit current availability and arc flash levels for each switchgear bus, medium voltage controller, switchboard, low voltage motor control center, distribution panelboard, automatic transfer switch, and branch circuit panelboard. This data shall be submitted prior to, or at the same time as, submitting the entire electrical gear package. Contractor shall utilize construction drawings to estimate approximate feeder lengths for this preliminary submittal. Submitted data shall include equipment/panel designations, feeder conductor sizes, feeder lengths, and calculated short circuit values and arc flash levels. Include the utility transformer ratings and transformer impedances used for the preparation of the short circuit calculations.
  - 2. Construction Period Submittal: During the construction period but prior to application of utility power to the electrical distribution system, submit an indexed copy of the complete protective device study based on actual field values. Include the following:
    - a. Introductory section with basic formulas, pertinent data, and rationale employed in the study.
    - b. One-line diagram for that portion of the system included in the study.
    - c. Calculations section showing tabulated calculations.
    - d. Results, recommendations, settings, etc.
  - 3. Provide one revision to study based on engineering review comments for the completed study to allow for minor modifications to adjustable circuit breakers to minimize arc flash levels.
- I. 26 0923 Occupancy Sensors
- 1. Submit manufacturer's data on occupancy sensors, control modules, wiring diagrams, interconnection diagrams and any related accessories.
  - 2. Submit scaled drawings with lighting fixtures shown clearly marked by manufacturer showing proper product, location and orientation of each sensor.
- J. 26 0943 Lighting Control Equipment
- 1. Submit manufacturer's data on lighting control equipment including, but not limited to published catalog data sheets, rough-in diagrams and instructions for installation, operating and maintenance, suitable for inclusion in maintenance manuals.
  - 2. Meet with the electrical engineer at their office prior to preparation of shop drawings to discuss and verify specific programming and zoning requirements of system(s).

3. Meet with the lighting representative/manufacturer of the approved and accepted lighting control equipment to verify and understand specific installation requirements associated with that system.
  4. Submit detailed drawings and documentation of lighting control components and interconnection including, but not necessarily limited to:
    - a. Electronic controllers
    - b. Control stations
    - c. Photo sensors
    - d. Occupancy sensors
    - e. Network wiring details
    - f. Input and output wiring details
    - g. Lighting control panel load schedules
    - h. Provide a complete sequencing and programming schedules for all devices, zones and scenes.
    - i. Wallstations layouts
    - j. Accurately scaled equipment layouts, wire/cable routing and connections to control wiring and electrical power feeders.
- K. 26 1010 Energy & Power Metering System
1. Submit manufacturer's data on all components.
  2. Submit riser diagrams and interconnection diagrams, wiring layouts etc. for advanced metering system including low voltage wiring interconnections; and communications and data line interconnections to system components and to the BAS/BMS (Building Automation System/Building Management System) equipment.
  3. The external wiring interconnections required by the electrical contractor shall be clearly identified on the shop drawings.
- L. 26 2200 Transformers
1. Submit manufacturer's data on transformers, including certification of transformer performance efficiency, percentage regulation at 100 percent and 80 percent power factor, no-load and full load losses in watts, percent impedance at 75 degrees C, hot-spot and average temperature rise above 40 degrees C ambient, sound level in decibels, and standard published data. Before submitting product data, verify that dimensions of units to be supplied allow proper code required clearances adjacent to unit.
  2. Submit dimensioned drawings of transformer installations, showing layout, mountings and supports, and spatial relationship to proximate walls and equipment.
  3. For types and ratings required, furnish additional fuses, amounting to one unit for every five installed units, but not less than three units of each (including ELSP fuses when specified).
- M. 26 2413 Switchgear and Switchboards
1. Submit manufacturer's data on switchgear and switchboards.
  2. Submit dimensioned drawings of switchgear and switchboards showing accurately scaled basic sections including, but not necessarily limited to, auxiliary

compartments, section components, and combination sections. Show plan view of equipment with dimensioned clearances to proximate equipment. Failure to submit said plan view shall not relieve contractor of responsibility to verify required clearances before release of equipment for fabrication.

3. Submit manufacturer's data and shop drawings only after completion of the preliminary protective device study (see Section 26 0573 as applicable). Any Section 26 2413 submittals received prior to submission of the preliminary protective device study will be REJECTED.
  4. For types and ratings required, furnish additional fuses, amounting to one unit for every 5 installed units, but not less than 3 units of each.
- N. 26 2416 Panelboards
1. Submit dimensioned drawings of panelboards and enclosures showing accurately scaled layouts of enclosures and required individual panelboard devices, including but not necessarily limited to, circuit breakers, fusible switches, fuses, ground-fault circuit interrupters, and accessories.
  2. Submit manufacturer data including specifications, installation instructions and general recommendations, for each type of panelboard required.
  3. Submit manufacturer's data and shop drawings only after completion of the preliminary protective device study (see Section 26 0573 as applicable). Any Section 26 2416 submittals received prior to submission of the preliminary protective device study will be REJECTED.
- O. 26 2713 Service Entrance
1. Submit manufacturer's data on service-entrance equipment and accessories.
  2. Submit dimensioned layouts of service-entrance equipment and spatial relationships to proximate equipment. Failure to submit said layouts shall not relieve contractor of responsibility to verify required clearances before release of equipment to fabrication.
  3. Submit manufacturer's data and shop drawings only after completion of the preliminary protective device study (see Section 26 0573 as applicable). Any Section 26 2713 submittals received prior to submission of the preliminary protective device study will be REJECTED.
  4. For types and ratings required, furnish additional fuses, amounting to one unit for every 2 installed units, but not less than one unit of each.
- P. 26 2726 Wiring Devices
1. Submit manufacturer's data on electrical wiring devices.
- Q. 26 2815 Overcurrent Protective Devices
1. Submit manufacturer's data on overcurrent protective devices, including catalog cuts, time-current trip characteristic curves, and mounting requirements.
  2. Submit layout drawings of overcurrent protective devices, with layouts of circuit breakers, including spatial relationships to proximate equipment. Failure to submit said spatial layouts does not relieve contractor of responsibility to verify all required clearances before release of equipment for fabrication.
  3. Submit manufacturer's data and shop drawings only after completion of the preliminary protective device study (see Section 26 0573 as applicable). Any Section 26 2815 submittals received prior to submission of the preliminary protective device study will be REJECTED.
  4. For types and ratings required, furnish additional fuses, amounting to one unit for



- every 5 installed units, but not less than two units of each size and type, unless specified otherwise in another section of these specifications.
5. Submit time-current trip curves (in log-log format) and trip setting parameter/range information (for each trip function) for all solid-state circuit breakers.
  6. Manufacturer shall also provide recommended trip settings with the shop drawing submittal (including ground fault settings) for coordination with downstream overcurrent devices. Manufacturer shall base recommendations on the AIC rating of the electrical equipment.
  7. Where the Protective Device Study specification section 260573 is included in the project, the time-current curves and recommended trip settings for all solid-state circuit breakers shall be submitted as part of the protective device study.
- R. 26 2816 Motor and Circuit Disconnects
1. Submit manufacturer's data including specifications, installation and general recommendations, for each type of motor and circuit disconnect switch required.
  2. Submit dimensioned drawings of electrical motor and circuit disconnect switches that have rating of 100 amperes and larger.
- S. 26 2913 Motor Starters
1. Submit manufacturer's data on motor starters.
  2. Submit dimensioned drawings of motor starters showing accurately scaled equipment layouts.
  3. After installation is complete, including water and air balancing, measure voltage (L-L and L-N) and full load current of each phase of each motor. Submit report showing field readings of voltage, amperage, service factor, and thermal heater size installed for each motor.
- T. 26 3100 Turnkey Photovoltaic (PV) Renewable Energy System
1. See Section for requirements.
- U. 26 3213 Emergency Electrical Systems
1. Dimensioned drawings of emergency electrical system components and accessories including, but not necessarily limited to generator sets, isolation/by-pass switches, day tanks, transfer switches, instruments and accessories, (and) annunciator panels, (and fuel line and exhaust piping). Show accurately scaled layouts of system components; indicate their spatial relationship to associated equipment; show connections to normal and emergency power feeders. Failure to submit said scaled lay-outs does not relieve contractor of responsibility to verify all required clearances before release of equipment for fabrication.
  2. Manufacturer's standard catalog data describing and depicting each engine-generator set, batteries, charger, tanks, and all ancillary equipment in sufficient detail to demonstrate complete specification compliance.
  3. Drawings depicting each of the following:
    - a. Base mounted equipment, with base and all attachments including anchor bolt template and recommended clearances for maintenance and operation.
    - b. Complete starting system, fuel system, cooling system, and exhaust system.
    - c. Electric wiring of relays, breakers, and switches with applicable single line and wiring diagrams and written description of operation and the instrumentation provided.

- d. Enclosure (if applicable).
  - 4. Manufacturer's standard catalog data describing and depicting each transfer and by-pass isolation switch along with all ancillary equipment in sufficient detail to demonstrate complete specification compliance. In addition provide the following:
    - a. One-line diagram of each switch assembly and wiring diagram of each unit.
    - b. A complete list of equipment and material to be provided, containing an adequate description of each separate item of equipment.
  - 5. Submit four complete sets of operating manuals for each item of equipment and/or component outlining the step-by-step procedure required for system start up, operation, and shutdown. Include the manufacturer's name, model number, and a description of all equipment, complete with basic operating features. Describe in detail all maintenance procedures and a troubleshooting guide listing possible breakdowns and repairs for each piece of equipment. Include all factory service manuals, complete parts lists, simplified schematic diagrams of each system as installed, and the original. Include complete test reports specified in Part 3-Execution herein.
- V. 26 3533 Power Conditioning Systems
- 1. See Section for requirements.
- W. 26 4313 Surge Protective Devices (SPD)
- 1. Submit manufacturer's data on SPD's listing all performance ratings specified or required herein.
  - 2. Submit dimensioned drawings of SPD's including, but not necessarily limited to, the following.
    - a. Complete data sheet.
    - b. Set of outline drawings giving complete mounting information, conduit entry and exit locations and dimensions, overall unit dimensions, weights, physical characteristics, etc.
    - c. Set of complete electrical drawings for power and control wiring.
    - d. Manufacturer's literature giving detailed information of equipment including parts numbers, model numbers and ratings.
    - e. UL 1449 suppressed voltage rating documentation.
- X. 26 5100 Interior and Exterior Building Lighting
- 1. Submit manufacturer's data on interior and exterior building lighting fixtures.
  - 2. Submit dimensioned drawings of lighting fixtures. Submit fixture shop drawings in PDF format with separate sheet for each fixture, assembled in luminaire "type" alphabetical order, with proposed fixture catalog number and accessories clearly indicated on each sheet.
  - 3. When applicable submit standard color samples with the shop drawings. If standard colors are not acceptable, a color sample will be provided to the fixture manufacturer. Return of the shop drawings will be delayed until color samples are provided.
  - 4. Submit driver manufacturer cut sheets.
  - 5. Submit a list of all lamps used on projects.
    - a. Stock of all spare items shall be delivered as directed to Owner's storage space. All components shall be labeled to match construction document

nomenclature,

- Y. 26 5600 Exterior Area Lighting
1. Submit manufacturer's data on lighting units, including certified dimension drawings of components including, but not necessarily limited to, poles and standards, mast arms, brackets, hardware and fixtures.
- Z. 27 1010 Structured Cabling Systems
1. See District Specification for more information regarding submittal requirements.
  2. Provide electronic submittals in Adobe PDF format within one file. Organize pages within submittal to be in the same order as the specification items (for example, racks prior to cabling). Where multiple submittals are provided due to submittal. If three or more reviews are required of the 27-1500 submittals, Contractor shall reimburse the Engineer for \$1,200 before the Engineer will commence the third review. rejections/corrections, upon completing the submittal process with "No Exceptions Taken", provide a consolidated single PDF submittal showing all products on the project.
  3. Provide proof of RDIGITAL COPYD certification and connectivity manufacturer certification.
  4. Provide submittals for all racks/cabinets; patch panels, devices, cabling, firestopping solutions, tray, non-continuous cable support devices, grounding equipment, and miscellaneous equipment to be used on project. Where multiple part numbers are listed on a datasheet/cutsheet, highlight or circle applicable part.
  5. Provide submittals showing complete racking layout in plan and elevation view to scale. Coordinate exact rack layout with Owner Information Technology Representative prior to submittal.
  6. Provide color samples of all available standard color faceplates to architect.
  7. Provide proposed labeling scheme for approval by owner/engineer.
  8. Provide catalog cutsheets of all test equipment that will be used.
  9. Provide results of all copper and fiber optic cable tests.
- AA. 27 4100 Audiovisual Systems
1. The following items shall be included in the shop drawings submittal:
    - a. Project manager's written proof, with signature and date, that shop drawings and/or brochure has been checked for accuracy prior to submittal. Shop drawings to comply in all respects with the requirements of the contract drawings and specifications for this project.
    - b. A complete bill of materials, broken out per system type, for all components, accessories and hardware to be provided in order to assemble a complete and working system as described within the contract documents.
      - i. The bill of material is intended to be used to verify equipment within each system. Only one cut sheet per unique product type is required.
      - ii. Example several systems may require the same flat panel display mount, that mount should be listed in each system type with only one (1) cut sheet provided for that product.
    - c. Manufacturer's data sheets and installation details for all devices, plates,

- cables and similar equipment. Product data showing multiple options, products and/or models shall be clearly marked identifying the specific options, products and/or models being provided.
- d. Signal flow drawings showing all audio, video, control, network and power connections required between all pieces of equipment within each system.
    - i. Unique cable/wire identifier for each connection that correspond to field cabling labelling scheme.
    - ii. All connections require connector type and sex to be identified. Type shall correspond to a connector legend or shall be clearly identified per instance.
    - iii. Wiring pinouts for all multipin connectors used
    - iv. Detailed panel drawings showing wall, floor, rack, etc. input/output panel dimensions, connector types and text labeling for each connection shown
    - v. Physical location information for each device.
    - vi. Upon request AV Consult's signal flow drawings may be utilized for signal flow documentation within the shop drawings, provided, the items above are included. Contractor shall make request for electronic files as indicated in section 1.2.C.
  - e. Equipment rack elevations.
  - f. Matrix routing and preset configuration tables, and digital signal processing configuration details.
  - g. Wireless microphone transmission frequencies.
  - h. Submit all manufacturer training, 3rd party and/or organization certificates for each equipment and/or systems required for the implementation of this specification.
  - i. Provide current equivalent if specified model has been discontinued.
2. All touch panel layouts, page logic functions and control system functionality, shall be submitted and approved by the Owner and AV Consultant prior to installation and programming of the control systems. Contractor shall submit the following information at the following stages during the construction of the GUI.
- a. Draft Stage: Draft drawings and/or sketches of; basic layouts, button details, text details and page flip progression. Include control schemes for all applicable devices in system.
  - b. Intermediate Stage: Intermediate Touch Panel Menus designed with manufacturer's software. Submit printouts and/or software files for review. Include detailed layouts, extensive control schemes for all controlled components, comprehensive button and text configurations, page flips and pop-up progression. Incorporate any changes or comments from previous stage mentioned above.
  - c. Demo Stage: Provide an active Touch Panel and controller to extensively demonstrate the operation of the control system. Demo of system shall be subject for review and considered as a deliverable. Include all revised detailed layouts, extensive control schemes for all controlled components, comprehensive button and text configurations, page flips and pop-up progression. Incorporate any changes or comments from the previous stage mentioned above.

- d. Final Stage: Submit Final Touch Panel Menus designed with manufacturer's software. Submit printouts and software files for review. Include all detailed layouts, all revised control schemes for all controlled components, revised button and text configurations, page flips and pop-up progression. Include final page configurations for control of system from the touch panel. Incorporate any and all changes or comments from the previous stage mentioned above.
- BB. 27 5123 Intercommunication Systems
1. Provide a complete bill of materials for all components, accessories and hardware to be provided in order to assemble a complete and working system as described within the contract documents.
  2. Provide wiring layouts for Audio, Video, Control, and power.
- CC. 28 1600 Intrusion Detection System
1. Submit manufacturer's data sheets including specifications, installation instructions, and general recommendation for each type of equipment specified.
  2. Submit dimensioned drawings and wiring layout for any changes in wiring from the layout on the drawings. Submit actual riser diagrams of complete system and elevations of required equipment. Typical risers are not acceptable.
  3. Contractor to provide a list of IP addresses of network devices with location and model #s.
- DD. 28 2205 Access Control System
1. Submit manufacturer's data sheets including specifications, installation instructions, and general recommendation for each type of equipment specified.
  2. Submit dimensioned drawings and wiring layout for any changes in wiring from the layout on the drawings. Submit actual riser diagrams of complete system and elevations of required equipment. Typical risers are not acceptable.
  3. Submit network switch port count and power requirements. Port count and POE switch requirements should be broken out per IDF/MDF closet.
  4. Submit manufacturer certifications for all systems provided. Certifications must be from local office providing the install.
  5. Provide the Owner the following upon project completion:
    - a. A complete set of shop drawings indicating: Locations of all panels, power supplies and controllers; point-to-point wiring diagrams for all devices.
    - b. A complete equipment list identifying: Type; model; manufacturer; manufacturer's data sheets.
    - c. A list of IP and MAC addresses, username and passwords for network devices coordinated with door name and/or location.
    - d. Serial and model numbers for all major components.
    - e. Installation manuals and user manuals for all systems listed in these specifications.
- EE. 28 2300 IP Video Surveillance System
1. Submit dimensioned drawings and wiring layout for any changes in wiring from the layout on the drawings. Submit actual riser diagrams of complete system and elevations of required equipment. Typical risers are not acceptable.

2. Submit network switch port count and power requirements. Port count and POE switch requirements should be broken out per IDF/MDF closet.
3. Submit manufacturer certifications for all systems provided. Certifications must be from local office providing the install.
4. Mid-span power budget calculations showing power requirements for all cameras.
5. Provide the Owner the following upon project completion:
  - a. A complete set of shop drawings indicating: Locations of all cameras, power supplies and controllers; point-to-point wiring diagrams for all devices.
  - b. Locations of all cameras with custom painted enclosures due to wood ceilings.
  - c. Contractor to provide a list of IP address for cameras coordinated with camera name and/or location.

FF. 28 3111 Fire Alarm and Detection System

1. Submit manufacturer's data on fire alarm and detection systems including, but not limited to, roughing-in diagrams and instructions for installation, operating and maintenance, suitable for inclusion in maintenance manuals.
2. Provide shop drawings showing equipment/device locations and connecting wiring of entire fire alarm and detection system. Include wiring diagrams and riser diagrams of panel. Provide dimensioned drawing of Fire Alarm Control Panel and Building Graphic. Shop drawings shall be prepared by an individual with a minimum NICET Level IV (Fire Protection Engineering/Fire Alarm Systems) certification. The individual's name and certification number shall be indicated on submittal design drawings.
3. Submit a written statement to the Architect and the state and local Fire Marshal's Office that each device of the fire alarm system will be installed, inspected and tested in accordance with applicable requirements of NFPA Standard 72.
4. Submit a complete set of documents to the Office of the State Fire Marshal containing the following information:
  - a. A complete set of shop drawings indicating:
    - i. Location of all alarm-initiating and alarm-signaling devices.
    - ii. Point-to-point wiring diagrams for all alarm-initiating and alarm-signaling devices.
  - b. Wiring diagrams for:
    - i. Alarm control panels.
    - ii. Auxiliary function relays and solenoids.
    - iii. Remote signaling equipment.
    - iv. Standby battery calculations, including voltage drop calculation.
  - c. A complete equipment list identifying:
    - i. Type
    - ii. Model

- iii. Manufacturer
- iv. Manufacturer catalog data sheets
- v. UL Listing and/or FM approval showing compatibility of device with Fire Alarm Control Panel (FACP)
- d. A complete zone list identifying all:
  - i. Alarm-initiating and alarm-signaling devices.
  - ii. Remote signaling and auxiliary function zones.
  - iii. Specific devices associated with each zone.
- e. Sample "System Record Document".
- f. Fire Alarm Key Plan Drawing showing the location of all device addresses and/or zones.

5. Address all comments from the Fire Marshal and instigate changes to the systems as applicable. Re-submit documents indicating changes instigated for final approval.

#### 1.4 OPERATION & MAINTENANCE MANUALS

- A. Provide operating instruction and maintenance data books for all equipment and materials furnished under this Division.
- B. Submit four copies of operating and maintenance data books for review at least four weeks before final review of the project. Assemble all data in a completely indexed volume or volumes and identify the size, model, and features indicated for each item. The binder (sized to the material) shall be a 2" slide lock unit (Wilson-Jones WLJ36544B). The cover shall be engraved with the job title in 1/2" high letters and the name and address of the Contractor in 1/4" high letters. Provide the same information in 1/8" letters on the spine.
- C. Include complete cleaning and servicing data compiled in clearly and easily understandable form. Show serial numbers of each piece of equipment, complete lists of replacement parts, motor ratings, etc. Each unit shall have its own individual sheet. (Example: If two items of equipment A and D appear on the same sheet, an individual sheet shall be provided for each unit specified).
- D. Include the following information where applicable.
  - 1. Identifying name and mark number.
  - 2. Certified outline Drawings and Shop Drawings.
  - 3. Parts lists.
  - 4. Performance curves and data.
  - 5. Wiring diagrams.
  - 6. Light fixture schedule with the lamps and ballast data used on the project for all fixtures
  - 7. Manufacturer's recommended operating and maintenance instructions.
  - 8. Vendor's name and address for each item.
- E. The engineer will review the manuals and when approved, will forward the manuals on to the architect. If the manuals are rejected twice, the contractor shall reimburse the engineer the sum of \$1,200.00 for each review afterwards.
- F. Provide high quality video and audio recording for all training sessions. All trainings shall be recorded by utilizing a pro-grade digital camera system. Utilize camera tripod and record audio directly at the presenter. Smartphone recordings are not allowed.
- G. Provide Operation and Maintenance Manual information for each section listed below in addition to the general requirements listed above.

1. 26 0526 Grounding
  - a. Test Results of measured resistance values
2. 26 0548 Electrical Seismic Control
  - a. Certificate of Compliance from Final Inspection
3. 26 0923 Occupancy Sensors
  - a. Record Drawings
    - i. A complete set of 'as-builts' drawings showing installed wiring, specific interconnections between all equipment, and internal wiring of this equipment shall be included in the operating and maintenance manuals upon complete of the system.
    - ii. Provide a DIGITAL COPY to the owner containing the information specified below. The DIGITAL COPY shall include all information required to allow the Owner to change the schedules themselves. The DIGITAL COPY shall contain a minimum of following:
      1. CAD drawing files of 'as-built' lighting control components and point to point connections.
      2. General configuration programming.
      3. Job specific configuration programming to include schedule.
      4. Tutorial file on complete programming of lighting control system.
4. 26 0943 Lighting Control Equipment
  - a. Record Drawings
    - i. A complete set of 'as-builts' drawings showing installed wiring, specific interconnections between all equipment, and internal wiring of this equipment shall be included in the operating and maintenance manuals upon complete of the system.
    - ii. Provide a DIGITAL COPY to the owner containing the information specified below. The DIGITAL COPY shall include all information required to allow the Owner to change the schedules themselves. The DIGITAL COPY shall contain a minimum of following:
      1. CAD drawing files of 'as-built' lighting control components and point to point connections.
      2. General configuration programming.
      3. Job specific configuration programming to include schedule.
      4. Tutorial file on complete programming of lighting control system.
5. 26 2913 Motor Starters
  - a. After installation is complete, including water and air balancing, measure



voltage (L-L and L-N) and full load current of each phase of each motor. Submit report showing field readings of voltage, amperage, service factor, and thermal heater size installed for each motor.

6. 26 3213 Emergency Electrical System
  - a. Manual Requirements
    - i. Submit four complete sets of operating manuals for each item of equipment and/or component outlining the step-by-step procedure required for system start up, operation, and shutdown. Include the manufacturer's name, model number, and a description of all equipment, complete with basic operating features. Describe in detail all maintenance procedures and a troubleshooting guide listing possible breakdowns and repairs for each piece of equipment. Include all factory service manuals, complete parts lists, simplified schematic diagrams of each system as installed, and the original. Include complete rest reports specified in Section 26 3213.
  - b. Test Results as outlines in Section 26 3213
7. 26 0943 Lighting Control Equipment
  - a. Record Drawings
    - i. A complete set of 'as-builts' drawings showing installed wiring, specific interconnections between all equipment, and internal wiring of this equipment shall be included in the operating and maintenance manuals upon complete of the system.
    - ii. Provide a DIGITAL COPY to the owner containing the information specified below. The DIGITAL COPY shall include all information required to allow the Owner to change the schedules themselves. The DIGITAL COPY shall contain a minimum of following:
      1. CAD drawing files of 'as-built' lighting control components and point to point connections.
      2. General configuration programming.
      3. Job specific configuration programming to include schedule.
      4. Tutorial file on complete programming of lighting control system.
8. 26 5100 Interior and Exterior Building Lighting
  - a. The supply two complete manuals consisting of, as a minimum, general system arrangement, lighting cutsheets, schematic of System components and options, factory test reports, trouble-shooting data, parts lists, preventative maintenance information, and warranty contact information.
9. 27 1010 Structured Cabling Systems
  - a. Test Results and requirements as outlined in Section 27 1010
  - b. Manual shall include all service, installation, programming and warranty, including test results for each cable.

- c. Provide laminated plans (minimum size 11 x 17) of all telecommunications record drawings (including riser diagrams) in each and every EF, ER and TR.
- d. Record Drawings
  - i. The Owner shall provide electronic (DWG) format of telephone/data system drawings that as-built construction information can be added. These documents will be modified accordingly by the telecommunications contractor to denote as-built information as defined above and returned to the Owner.
  - ii. Provide a complete set of "as built" drawings in paper and electronic (DWG and PDF) formats showing cabinets, racks, patch panels, wiring, specific interconnections between all equipment and internal wiring of equipment within 30 working days of completion. Drawings are to include all labeling information used in denoting equipment used in the installation. Labeling, icons, and drawing conventions used shall be consistent throughout all documentation provided.

10. 275123 Intercommunications Systems

a. Manual Requirements

- i. Operating and maintenance manuals shall be submitted prior to testing of system. Manuals shall include all model numbers, service, installation, and programming information.
- ii. Include all the following information:
  1. Warranty
  2. Network settings
  3. Riser diagrams from Shop drawings
  4. Training videos
  5. Flash drive with programing source code and software editing programs

b. Record Drawings

- i. The Owner shall provide electronic (DWG) format of intercom System system drawings that as-built construction information can be added to. These documents will be modified by the intercom contractor to denote as-built information as defined above and returned to the Owner.
- ii. Provide a complete set of "as built" drawings in paper and electronic (DWG and PDF) formats showing cabinets, racks, patch panels, wiring, specific interconnections between all equipment and internal wiring of equipment. Drawings are to include all labeling information used in denoting equipment used in the installation. Labeling, icons, and drawing conventions used shall be consistent throughout all documentation provided.

11. 27 3244 Two-Way Communication system

- a. Record Drawings
    - i. Provide As-Built drawings that include changes to wiring, wiring designations, junction box labeling, and other pertinent information.
12. 27 4110 Audiovisual Systems
- a. Manual Requirements
    - i. Operating and maintenance manuals shall be submitted prior to testing of system. Manuals shall include all model numbers, service, installation, and programming information.
    - ii. Include all the following information:
      1. Warranty
      2. Network settings
      3. Riser diagrams from Shop drawings
      4. Training videos
      5. Flash drive with programing source code and software editing programs
  - b. Record Drawings
    - i. The Owner shall provide electronic (DWG) format of AV System system drawings that as-built construction information can be added to. These documents will be modified by the AV contractor to denote as-built information as defined above and returned to the Owner.
    - ii. Provide a complete set of "as built" drawings in paper and electronic (DWG and PDF) formats showing cabinets, racks, patch panels, wiring, specific interconnections between all equipment and internal wiring of equipment. Drawings are to include all labeling information used in denoting equipment used in the installation. Labeling, icons, and drawing conventions used shall be consistent throughout all documentation provided.
13. 28 1600 Intrusion Detection System
- a. Record Drawings
    - i. A complete set of CAD "AS-BUILT" Drawings showing installed wiring, color coding, specific interconnections between all equipment, and internal wiring of the equipment shall be delivered to the owner upon completion of the system.
    - ii. A building map (2 copies) shall be supplied to the owner indicating the exact location of all devices along with the addresses of the individual devices. Install building security map adjacent to the security control panel. Provide high quality plastic sign (map holder) with two layers. The back layer shall be painted black. The front layer shall be a clear center for viewing the CAD security drawing. Edges of the sign shall be colored to match the building interior. The building map shall indicate the various by the use of different colors (minimum of five

colors).

- iii. The USB flash drive containing the files shall be supplied to the owner. These shall include all information required to allow the district to change the security program themselves. The flash drive shall contain a minimum of the following:
  - 1. CAD drawing files of building security map.
  - 2. CAD drawing files of AS BUILT security components and point to point connections.
  - 3. General configuration programming.
  - 4. Job specific configuration programming.
  - 5. Tutorial file on complete programming of security system.

14. 28 2205 Access Control Systems

a. Manual Requirements

- i. Manuals shall include all service, installation and programming information.

b. Record Drawings

- i. A complete set of CAD "AS-BUILT" Drawings showing installed wiring, color coding, specific interconnections between all equipment, and internal wiring of the equipment shall be delivered to the owner upon completion of the system.
- ii. A building map (2 copies) shall be supplied to the owner indicating the exact location of all devices along with the addresses of the individual devices. Install building security map adjacent to the security control panel. Provide high quality plastic sign (map holder) with two layers. The back layer shall be painted black. The front layer shall be a clear center for viewing the CAD security drawing. Edges of the sign shall be colored to match the building interior.
- iii. The USB flash drive containing the files shall be supplied to the owner. The flash drive shall include all information required to allow the district to change the security program themselves. The flash drive shall contain a minimum of the following:
  - 1. CAD drawing files of building security map.
  - 2. CAD drawing files of AS BUILT security components and point to point connections.
  - 3. General configuration programming.
  - 4. Job specific configuration programming.
  - 5. Tutorial file on complete programming of security system.

15. 28 2301 Video Surveillance System

a. Record Drawings

- i. A complete set of CAD “AS-BUILT” Drawings showing installed wiring, color coding, specific interconnections between all equipment, and internal wiring of the equipment shall be delivered to the owner upon completion of the system.
- ii. A building map (2 copies) shall be supplied to the owner indicating the exact location of all devices along with the addresses of the individual devices. Install building security map adjacent to the security control panel. Provide high quality plastic sign (map holder) with two layers. The back layer shall be painted black. The front layer shall be a clear center for viewing the CAD security drawing. Edges of the sign shall be colored to match the building interior.
- iii. The USB flash drive containing the files shall be supplied to the owner. The flash drive shall include all information required to allow the district to change the security program themselves. The flash drive shall contain a minimum of the following:
  - 1. CAD drawing files of building security map.
  - 2. CAD drawing files of AS BUILT components and point to point connections.
  - 3. General configuration programming.
  - 4. Job specific configuration programming.
  - 5. Tutorial file on complete programming of security system.

16. 28 3113 Fire Alarm and Detection System

a. Manual Requirements

- i. Operating and maintenance manuals shall be submitted prior to testing of the system. Manuals shall include all service, installation, and programming information.

b. Record Drawings

- i. A complete set of CAD "as-built" drawings showing installed wiring, color coding, specific interconnections between all equipment, and internal wiring of the equipment shall be delivered to the owner upon completion of the system. Vendor shall not request drawings from the Engineer. Vendor shall request current architectural drawings from the Architect and include all cost with bid.
- ii. A building map shall be supplied to the owner indicating the exact location of all devices along with the addresses of the individual devices. Install building fire alarm map adjacent to the fire alarm panel and all remote operating panels. Provide high quality plastic sign (map holder) with two layers. The back layer shall be painted black. The front layer shall be a clear center for viewing the CAD fire alarm drawing. Edges of the sign shall be colored to match the building interior. The building map shall indicate the various devices and wiring by the use of different

colors (minimum of five colors).

- iii. Provide a DIGITAL COPY to the Owner containing the information specified below. The DIGITAL COPY shall include all information required to allow the Owner to change the fire alarm program themselves. The DIGITAL COPY shall contain a minimum of the following:
  - 1. CAD drawing files of building fire alarm map.
  - 2. CAD drawing files of as-built fire alarm components and point to point connections.
  - 3. General configuration programming.
  - 4. Job specific configuration programming.
- c. Final Submittal to the Office of the Fire Marshal
  - i. Record of Completion: Provide a completed System Record of Completion (NFPA 72-Figure 4.5.2.1) in accordance with Section 4.5.3.
  - ii. Operation Instructions and A-Built Drawings: Provide one set of instructions on operation of the Fire Alarm System and one set of As-Built drawings. Demonstrate compliance of installation of the System Record Documents at or near the fire alarm control unit.
  - iii. Fire Alarm Key Plan Drawing: Demonstrate compliance of installation of the fire alarm key plan drawing at the FACP.
- b. TUTORIAL FILE ON COMPLETE PROGRAMMING OF FIRE ALARM SYSTEM

**1.5 SPARE PARTS:**

- A. Provide spare parts (fuses, diffusers, lamps, etc.) as specified. Transmit all spare parts to Owner's Representative prior to substantial completion. Any unused material/labor not utilized during construction shall be a credit back to the owner. Utilize Project Tracking Document to keep record of the following items.

| Section         | Section Name                        | Description   | Qty. Rqrd.      | Qty Rcvd | Fulfilled? |
|-----------------|-------------------------------------|---|-----------------|----------|------------|
| 26 0532         | Conduit Raceway                     | Provide 1000 feet of 3/4" conduit with 4 #12 conductors, 1000 feet of 3/4" conduit with 4 #10 conductors, and 1000 feet of 1" conduit with 4 #10 conductor in PVC Provide all supports, fittings, boxes, terminations, etc. as required for installation. Install only as directed by engineer. | Per description |          |            |
| 26 0923/26 0943 | Lighting Controls/Occupancy Sensors | Spare sensors for each type used on project.  | 7               |          |            |
|                 |                                     | Spare wallstations for each type used on project. (RC1, RC2)  | 7               |          |            |
| 26 2200         | Transformers                        | Maintenance Stock Fuses: For types and ratings required, furnish additional fuses, amounting to one unit for every five installed units, but not less than three units of each (including ELSP fuses when specified).   | Per description |          |            |
| 26 2413         | Switchgear and Switchboards         | Maintenance Stock Fuses: For types and ratings required, furnish additional fuses, amounting to one unit for every 5 installed units, but not less than 3 units of each. (Attic Stock)  | Per description |          |            |
| 26 2713         | Service Entrance                    | Maintenance Stock Fuses: for types and ratings required, furnish additional fuses, amounting to one   | Per description |          |            |

|         |   |  |                 |  |  |
|---------|---|--|-----------------|--|--|
|         |   | for every 2 installed units, but not less than one unit of each. (Attic Stock)   |                 |  |  |
| 26 2726 | Wiring Devices                          | Provide (2) switches, and (8) duplex receptacles as directed by the Engineer. Include 25' of 3/4" EMT conduit with 4 #12 THHN for each device.<br><br>Provide a total of (5) spare floor boxes covers for each box type used (Attic Stock).  |                 |  |  |
| 26 2816 | Motor and Circuit Disconnects           | Spare fuses amounting to one spare fuse for each 10 installed but not less than three of any one type and size. (Attic Stock)  | Per description |  |  |
| 26 2913 | Motor Starters                          | Maintenance Stock Fuses: For types and ratings required, furnish additional fuses, amounting to one unit for every 10 installed, but not less than 5 units of each, for both power and control circuit fuses. (Attic Stock)  | Per description |  |  |
| 26 5100 | Interior and Exterior Building Lighting | Provide the following attic Stock Fixtures:<br><br>A55: 5<br>A65: 5<br>L4HD: 4<br>SL2C: 3<br>EZT44: 10<br>EZT45: 10  |                 |  |  |
|         |   | Provide (5) extra type X1 and (2) X2 exit signs for discretionary placement by fire marshal or code official. Include 150' of 3/4" EMT conduit with 3 #12 THHN for each exit sign. Provide all supports, fittings, boxes, terminations, etc. as required for installation. Install only as directed by engineer. | Per description |  |  |
| 27 1010 | Structured Cabling System               | Provide (6) type 2 drop data outlets, (2) WAPs, (6) type 'W' IP phone outlets. Include 30 meters of 1" EMT. Provide all supports, fittings, boxes, terminations, etc. as required for installation. Install only as directed by engineer. Credit back all unused material and labor to the Owner.                | Per description |  |  |
| 27 5123 | Intercommunication System               | Type IC1 speakers  | 2               |  |  |
|         |   | Type IW1 speakers (Exterior Type)  | 2               |  |  |
|         |   | Back boxes   | 2               |  |  |
|         |   | Call switches  | 2               |  |  |
|         |   | 150 feet of conduit and cable per each spare device  | Per description |  |  |
| 28 2205 | Access Control System & Burglar Alarm   | Card Readers (Standard)  | 3               |  |  |
|         |   | Card Readers (Mullion)   | 2               |  |  |
|         |   | Burglar Door Contacts  | 3               |  |  |
|         |   | 150 feet of conduit with wiring (completely installed and wired) for each spare device   | Per description |  |  |
| 28 3111 | Fire Alarm and Detection                | Thermal detectors with base  | 2               |  |  |
|         |   | Smoke detectors with base  | 5               |  |  |
|         |   | Strobe/horns   | 5               |  |  |
|         |   | Manual pull stations with addressable modules  | 1               |  |  |
|         |   | Duct smoke detectors   | 4               |  |  |
|         |   | Carbon Monoxide Detector and Monitor Module  | 2               |  |  |
|         |   | 150 feet of conduit with wiring (completely installed and wired) for each spare device   | Per description |  |  |

**END OF SECTION 26 0502**



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## SECTION 26 0507

### ELECTRICAL CONNECTIONS FOR EQUIPMENT

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-23 section making reference to electrical connections.

##### 1.2 DESCRIPTION OF WORK:

- A. Extent of electrical connection for equipment includes final electrical connection of all equipment having electrical requirements. Make final connections for all owner furnished equipment. See other applicable portions of specification for building temperature control wiring requirements.
- B. Refer to Division-23 sections for motor starters and controls furnished integrally with equipment; not work of this section.
- C. Refer to Division-23 section for control system wiring; not work of this section.
- D. Refer to Division-23 section for Snow/ice melting, Gutter and downspout snow/ice melting system wiring; not work of this section.
- E. Refer to sections of other Divisions for specific individual equipment power requirements.

##### 1.3 QUALITY ASSURANCE:

- A. NEC COMPLIANCE: Comply with applicable portions of NEC as to type products used and installation of electrical power connections.
- B. UL LABELS: Provide electrical connection products and materials that have been UL-listed and labeled.

#### PART 2 - PRODUCTS

##### 2.1 GENERAL:

- A. For each electrical connection indicated, provide complete assembly of materials, including but not necessarily limited to, raceways, conductors, cords, cord caps, wiring devices, pressure connectors, terminals (lugs), electrical insulating tape, heat-shrinkable insulating tubing, cable ties, solderless wire nuts, and other items and accessories as needed to complete splices, terminations, and connections as required. Crimp on or slip-on type splicing materials (insulation displacement type) designed to be used without wire stripping are not acceptable. See Section 26 0532, Conduit Raceways; Section 26 2726 Wiring Devices; and Section 26 0519 Conductors and Cables for additional requirements. Provide final connections for equipment consistent with the following:
  - 1. Permanently installed fixed equipment - flexible seal-tite conduit from branch circuit terminal equipment, or raceway; to equipment, control cabinet, terminal junction box or wiring terminals. Totally enclose all wiring in raceway.

2. Movable and/or portable equipment - wiring device, cord cap, and multi-conductor cord suitable for the equipment and in accordance with NEC requirements (Article 400).
3. Other methods as required by the National Electrical Code and/or as required by special equipment or field conditions.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION OF ELECTRICAL CONNECTIONS:**

- A. Make electrical connections in accordance with connector manufacturer's written instructions and with recognized industry practices, and complying with requirements of NEC and NECA's "Standard of Installation" to ensure that products fulfill requirements.
- B. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams.
- C. Coordinate installation of electrical connections for equipment with equipment installation work.
- D. Verify all electrical loads (voltage, phase, horse power, full load amperes, number and point of connections, minimum circuit ampacity, etc.) for equipment furnished under other Divisions of this specification, by reviewing respective shop drawings furnished under each division. Meet with each subcontractor furnishing equipment requiring electrical service and review equipment electrical characteristics. Report any variances from electrical characteristics noted on the electrical drawings to Architect before proceeding with rough-work. In summary, it is not in the Electrical Engineers scope to review the shop drawings from other trades/divisions.
- E. Obtain and review the equipment shop drawings to determine particular final connection requirements before rough-in begins for each equipment item.
- F. Refer to basic materials and methods Section 26 0553 Electrical Identification, Conductors, for identification of electrical power supply conductor terminations.

**END OF SECTION 26 0507**

## SECTION 26 0510

### ELEVATOR ELECTRICAL REQUIREMENTS

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
  - 1. Refer to Hydraulic Elevators Section 14 24 00 –
- B. Architectural, Structural, Vertical Transportation, Mechanical and other applicable documents are considered a part of the electrical documents insofar as they apply as if referred to in full. Contractor must review the entire set of plans and specifications. Reviewing only the electrical set is not acceptable.
- C. Elevator Shop Drawings.

##### 1.2 DESCRIPTION OF WORK:

- A. The extent of electrical work is indicated on drawings and/or specified in Divisions 26, 27 and 28 sections of the specification. Provide all labor, materials, equipment, supervision and service necessary for a complete/operating/code compliant electrical system.
- B. Carefully review elevator shop drawings prior to ordering elevator disconnects. Confirm physical dimensions of disconnect fit within enclosure (if provided) from elevator manufacturer. Review elevator shop drawings prior to ordering disconnect. Notify engineer in writing immediately, should any discrepancy occur. Confirm voltage and phase of equipment and compare with electrical drawings.
- C. Coordinate the installation with the elevator manufacturer, including the sequencing of the electrical installation.
- D. Anticipated 40-HP 480/277V/3P/60hz Electrical Specifications.

##### 1.3 QUALITY ASSURANCE:

- A. Coordination: All electrical equipment placement and installation shall be coordinated with the elevator contractor and shall not be located until elevator equipment is installed or coordination has been arranged with elevator contractor's equipment placement.
- B. Regardless of whether shown on drawings:
  - 1. All electrical equipment, located less than 1225 mm (48 in.) above the pit floor, shall be weatherproof (NEMA 4X) and have wiring identified for use in wet locations in accordance with the requirements in NFPA 70.
  - 2. Receptacles:
    - a. Provide one 120V/20A dedicated GFCI receptacle in each elevator machine rooms, machinery spaces and elevator pit areas. Provide an additional 120V/20A dedicated receptacle in the pit for a sump pump. Any receptacle installed in pits, machinery spaces, or elevator car tops shall be GFCI. Exception: Sump pump shall not require GFCI protection.
    - b. Provide one GFCI receptacle located at the top of the hoistway and machine room.
  - 3. Clearances around all electrical equipment in the elevator machine room shall comply with NEC 110-26 electrical clearances requirements. The electrical contractor's work and equipment placement shall be coordinated with the

elevator contractor's equipment placement.

4. All electrical piping runs provided by the electrical contractor and elevator contractor to the elevator equipment shall be run overhead or in a manner which does not restrict access to and around any equipment.
5. Lighting:
  - a. Elevator Pits:
    - i. Provide light fixture and light switch at the pit.
    - ii. The location shall be determined after coordination with the elevator contractor so that the light fixture is located out of the way of all elevator equipment.
    - iii. Sub-Pit Light fixture and Light Switches (when present): If there is more than one level of an elevator pit, a three-way switch shall be provided in both the pit areas to operate a light fixture located in both locations. A light fixture shall be installed in each pit level. Both light fixtures shall be wired so that they both operate at the same time by light switches at both pit levels.
    - iv. The switch shall be a minimum of 18 inches above the elevator lowest landing doorsill and adjacent to (not behind) the pit access ladder.
    - v. The elevator pit shall have a separate branch circuit supplying pit lighting and receptacle(s) and another for the pit sump pump.
  - b. Elevator Machine Rooms:
    - i. Light switches shall be required in all elevator machine rooms adjacent to the jamb side of the machine room entry door.
    - ii. A separate branch circuit shall supply the elevator machine room space lighting and receptacles.
    - iii. Provide 200 Lux (19FC) light level measured at the floor level.
  - c. Elevator Cars:
    - i. Provide a separate branch circuit to supply the car lights, receptacle(s), auxiliary lighting power source, and ventilation on each elevator car. It shall be lockable and shall be supplied in all elevator machine rooms. One disconnect required for each elevator. A label stating the location of the supply side overcurrent protection device is required on the disconnect.
  - d. Hoistway:
    - i. Provide light fixture every 1.5 stories within the hoistway and at the top of the hoistway if elevator disconnect is mounted on the elevator cab.
6. Fire Alarm:
  - a. Provide a smoke detector and heat detector within each elevator hoistway.
  - b. Provide a smoke detector and heat detector in machine room.

- c. Provide a heat detector within the space that houses the elevator controller. Heat detector to activate shunt trip and be located within 24” of the sprinkler head.
- d. For each group of elevators, provide a normally closed contact representing the smoke detector at the designated return landing.
- e. For each group of elevators, provide a normally closed contact representing all smoke detectors located in lobbies, hoistways, or machine rooms / machine space, but not the smoke detector at the designated return landing or the smoke detectors as described in i. and ii. below:
  - i. If a smoke detector is located in the hoistway at or below the lower of the two recall landings, it shall be wired to activate the same normally closed contact as the smoke detector located in the lobby at the lower of the two recall landings.
  - ii. If machine rooms / machine space is located at the designated return landing, the smoke detectors located therein shall be wired to activate the same normally closed contact as the smoke detector at the designated landing.
- f. Requirements for intermittently illuminating the fire hat visual signal in the car operating panel, either i. or ii. apply.
  - i. For a single unit or for a group of elevators having one common machine room / machine space and one common hoistway, provide one additional normally closed contact representing the machine room / machine space and hoistway smoke detectors.
  - ii. If the group contains more than one hoistway and hoistway smoke detectors are installed, or if the group has more than one machine room / machine space, provide one normally closed contact for each elevator. The contact is to represent the smoke detector in the machine room / machine space for that particular elevator, and any smoke detectors in the hoistway containing that particular elevator.
- g. If sprinklers are installed in the hoistway or machine room / machine space(s), a means to automatically disconnect the mainline power supply to the affected elevator and any other power supplies used to move the elevator, upon or prior to the application of water is required and shall be provided (unless prohibited by local code). Smoke detectors shall not be used to activate sprinklers in hoistways or machine rooms / machine spaces or to disconnect the mainline power supply.
- h. Heat sensors used to automatically disconnect the mainline power supply prior to the application of water from sprinklers shall be provided with a normally closed contact with wiring from the sensing device to a controller designated by Elevator Manufacturer / Elevator Equipment Installer. The normally closed contact shall be closed when the heat sensor is not activated and shall be open when the heat sensor is activated.

7. Sump Pumps:
  - a. Provide (1) 120V receptacle on a dedicated 20A circuit in each elevator pit for the elevator sump pump.
8. Elevator Main Disconnect:
  - a. Provide in all elevator machine rooms in sight of elevator motor and controller and adjacent to machine room entry door, one disconnect required for each elevator. Provide a label on the disconnect stating location of overcurrent protection device.
  - b. Hydraulic Elevator Only: Main Line Disconnect Auxiliary Contact for Emergency Battery Lowering Operation: This item is provided by the electrical contractor within the main line disconnect: If an emergency lowering system is utilized on a hydraulic elevator, there shall be an auxiliary contact associated with the main line disconnect.
  - c. Shunt Trip Required When Sprinklers are Present: Electrical contractor shall provide a shunt trip for the elevator main line power in order to remove power from elevator controls before any sprinkler is activated in the elevator machine room and hoistway overhead. The shunt trip shall be installed in the elevator machine room.
9. Emergency Power Requirements:
  - a. Emergency generator power will not be provided at elevator. Set-up elevator operation to run with elevator emergency power supply when the normal building power supply fails, and in compliance with ASME A17.1 requirements.
    - i. Elevator Emergency Power Supply: Supplied by battery backup; provide elevator system components as required for emergency power characteristics.
    - ii. Emergency Lighting: Comply with ASME A17.1 elevator lighting requirements.
    - iii. Provide operational control circuitry for adapting the change from normal to emergency power.
    - iv. Upon transfer to emergency power, advance one elevator at a time to a pre-selected landing, stop car, open doors, disable operating circuits, and hold in standby condition.
10. Emergency Phone and Data Line: Provide (2)  $\frac{3}{4}$ " conduits from the communications utility to each elevator machine room / elevator controller. Electrical contractor shall provide electrical conduit for both the emergency elevator phone and required data line to the elevator machine room, to the elevator controller, and terminated on the elevator controller with coordination from the elevator contractor.
11. Provide copper elevator feeder conductors and grounding conductors.
12. Provide card readers at all elevators locations throughout the project. Card readers shall interface with the elevator controller and be programmed to utilize building-based access control system and identification/credential cards. After the valid credential card is read, the elevator shall call the elevator to the associated floor and allow users to the elevator and to travel to different floor levels.

## 1.4 SUBMITTALS

- A. Refer to Section 26 0502 for requirements.

## PART 2 - PRODUCTS

### 2.1 ELEVATOR DISCONNECTS:

#### A. GENERAL:

1. Provide Power Module Switch in a single NEMA enclosure with all necessary relay(s), control transformer and other options (as listed below), and as shown on drawings. The Power Module Switch shall have an ampere rating as required in the elevator shop drawings, and shall include a horsepower rated fusible switch with shunt trip capabilities.
2. The amp rating of the switch shall be based upon elevator manufacturer requirements and utilize Class J Fuses. It shall include a 100VA control power transformer with primary and secondary fuses. Unit shall also contain an isolation relay (3PDT, 10 amp, 120V). A normally open dry contact shall be provided by the Fire Alarm Safety System to energize the isolation relay and activate the shunt trip solenoid.
3. Provide the following additional features:
  - a. Key to Test Switch
  - b. "ON" Green Pilot Light
  - c. If elevator is hydraulic, provide 1P NC Mechanically Interlocked Auxiliary Contact.
  - d. Fire Alarm Voltage Monitoring Relay (Needed to comply with NFPA 72)
  - e. NEMA enclosure appropriate for the environment installed.
  - f. All switches shall have shunt trip capabilities at 120Vac from remote fire safety signal.

#### B. ACCEPTABLE MANUFACTURER:

1. Manufacturer: Subject to compliance with requirements. Provide elevator-disconnect of one of the following:
  - a. Bussman Quick-Spec Power Module Switch Elevator Disconnect.
  - b. Littlefuse LPS Series Elevator Disconnect.

## PART 3 – EXECUTION

- 3.1 Install disconnect switches where indicated, complying with manufacturer's written instructions, applicable requirements of NEC, NEMA, and NECA's "Standard of Installation" and in accordance with recognized industry practices to ensure that products fulfill requirements.
- 3.2 Coordinate motor and circuit disconnect switch installation work with electrical raceway and cable work, as necessary for proper interface.
- 3.3 Install disconnect switches used with motor driven appliances, and motors and controllers within sight of controller position.
- 3.4 Grounding: Grounding shall be supplied from the elevator main line disconnect and controller to the upstream panel and building ground. Ground wire shall be the same size as phase wires to



minimize electrical noise interference. Non-elevator related piping and equipment is prohibited in the machine room or hoistway.

**END OF SECTION 26 0510**



## PART 2 - PRODUCTS

### 2.1 COPPER AND ALUMINUM CONDUCTORS (600V):

- A. Provide factory-fabricated conductors of sizes, ratings, materials, and types indicated for each service. Where not indicated provide proper selection to comply with project's installation requirements and NEC standards. Provide conductors in accordance with the following:
1. Service Entrance Conductors – Copper/Aluminum conductor; see drawings for insulation type.
  2. Distribution and Panelboard Feeders; and Other Conductors, #2 AWG and Larger – Copper/Aluminum conductor; see drawings for insulation type.
  3. Branch Circuit Conductors and All Conductors #3 AWG and Smaller - Copper conductor, with THHN/THWN insulation. Size all conductors in accordance with NEC; minimum size to be #12 AWG.
  4. Aluminum Conductors. Where aluminum conductors are specified for use, provide compact stranded Aluminum Association 8000- series alloy conductor material.
    - a. [Stabiloy - Alcan Cable](#)
    - b. [Triple E - Southwire](#)
- B. Provide connectors and terminations for aluminum-alloy conductors of hydraulic compression type only, listed under UL 486-B, and marked "AL 7CU" for 75o rated circuits, and "AL9CU" for 90o rated circuits.
- C. Provide a maximum of three phase conductors in any one conduit or as approved by electrical engineer. Where phase conductors share a common neutral they must have a means to simultaneously disconnect all ungrounded conductors at the point where the branch circuits originate. The ungrounded and neutral conductors of a multi-wire branch circuit must be grouped together by wire ties at the point of origination.
- D. Provide neutral and ground wire as specified elsewhere in documents.
- E. Provide separate neutral conductor for all single phase branch circuits installed. No shared neutrals are allowed. Neutral conductor shall be the same size as the phase conductor.

### 2.2 FIRE-RESISTIVE CABLE:

- A. Mineral Insulated Copper (MI) Copper Sheathed Cable:
1. General:
    - a. Provide 1/c type system 1850 sheathed power cable, conforming to current standards of UL system No. 1850.
    - b. Cable shall be classified as 2-hour fire resisting cable and shall comply with NEC articles 695 and 700 as an "Electrical Circuit Protective System" with a minimum 2-hour fire rating.
    - c. Construct cable with copper conductor with highly compressed magnesium oxide insulation and seamless soft-drawn copper sheath.
    - d. Provide termination kits as recommended by cable manufacturer.
  2. Manufacturer:
    - a. Subject to compliance with requirements, provide products of one of the following:

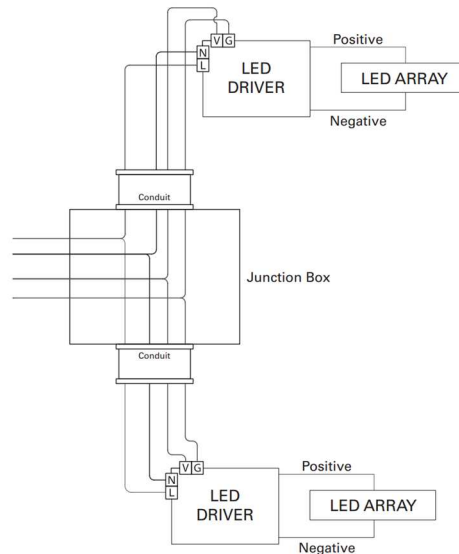
- i. Pentair – Pyrotex System 1850

### 2.3 COPPER LOW VOLTAGE CONDUCTORS (0-10V CIRCUITS):

#### A. 0-10V Class 1 Circuits:

##### 1. General:

- a. Provide Class 1 circuits for all 0-10V dimming installations. Class 1 circuits shall be permitted to be installed with other circuits as specified in NEC 725.48 (A) and (B):
  - i. Class 1 circuits shall be permitted to occupy the same cable, cable tray, enclosure, or raceway without regard to whether the individual circuits are alternating or direct current, provided all conductors are insulated for the maximum voltage of any conductors in the cable, cable tray, enclosure or raceway.
  - ii. Class 1 circuits shall be permitted to be installed with power supply conductors as specified:
    - 1. Class 1 and power supply circuits shall be permitted to occupy the same cable, enclosure, or raceway only when functionally associated.
  - iii. Utilize VIOLET and PINK copper conductors, with THHN/THWN insulation.



### PART 3 - EXECUTION

#### 3.1 INSTALLATION:

- A. General: Install electric conductors and cables as indicated, in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standards of Installation", and in accordance with recognized industry practices.
- B. Coordinate installation work with electrical raceway and equipment installation work, as necessary for proper interface.
- C. Cables may be pulled by direct attachment to conductors or by use of basket weave pulling grip applied over cables. Attachment to pulling device shall be made through

approved swivel connection. Nonmetallic jacketed cables of small size may be pulled directly by conductors by forming them into a loop that pull wires can be attached; remove insulation from conductors before forming the loop. Larger sizes of cable may be pulled by using basket weave pulling grip, provided the pulling force does not exceed limits recommended by manufacturer; if pulling more than one cable, bind them together with friction tape before applying the grip. For long pulls requiring heavy pulling force, use pulling eyes attached to conductors.

- D. Do not exceed manufacturer's recommendations for maximum allowable pulling tension, side wall pressure, and minimum allowable bending radius. In all cases, pulling tension applied to the conductors shall be limited to 0.008 lbs. per circular mil of conductor cross-section area.
- E. Pull in cable from the end having the sharpest bend; i.e. bend shall be closest to reel. Keep pulling tension to minimum by liberal use of lubricant, and turning of reel, and slack feeding of cable into duct entrance. Employ not less than one man at reel and one in pullhole during this operation.
- F. For training of cables, minimum bend radius to inner surface of cable shall be 12 times cable diameter.
- G. Where cable is pulled under tension over sheaves, conduit bends, or other curved surfaces, make minimum bend radius 50% greater than specified above for training.
- H. Use only wire and cable pulling compound recommended by the specific cable manufacturer, and that is listed by UL.
- I. Seal all cable ends unless splicing is to be done immediately. Conduit bodies shall not contain splices.
- J. Support all cables in pullholes, concrete trenches, and similar locations by cable racks and secure to rack insulators with nylon cord or self-locking nylon cable ties. Place each cable on separate insulator. In manholes, pullholes, concrete trenches, and similar locations, wrap strips of fire-proofing tape (approx. 1/16 inch thick by 3 inches wide) tightly around each cable spirally in half-lapped wrapping or in two butt-joined wrappings with the second wrapping covering the joints in the first. Apply tape with the coated side toward the cable, and extend tape one inch into the ducts. To prevent unraveling, random wrap the fireproofing tape the entire length of the fireproofing with pressure sensitive glass cloth tape. Provide fireproofing tape of a flexible, conformable fabric having one side coated with flame retardant, flexible, polymeric coating and/or a chlorinated elastomer not less than 0.050 inch thick weighing not less than 2.5 pounds per square yard. Provide tape that is noncorrosive to cable sheath, self-extinguishing, and that will not support combustion. Construct tape of materials that do not deteriorate when subjected to oil, water, gases, salt water, sewage and fungus.
- K. Follow manufacturer's instructions for splicing and cable terminations.
- L. Fire Protected Circuits:
  - 1. Provide protected circuits for emergency feeders for the following occupancies:
    - a. Educational occupancies with more than 300 occupants.
  - 2. Feeders shall be protected by one of the following. Electrical contractor shall be responsible for meeting one of the following methods:
    - a. Feeder is protected by a listed assembly with a minimum 2 hour fire rating.
    - b. Feeder is listed a fire-resistive cable assembly.
    - c. Feeder is encased in a minimum of 2" concrete.

**3.2 AFTER INSTALLATION TEST FOR CABLE 600 VOLTS AND BELOW:**

- A. Prior to energization, test cable and wire for continuity of circuitry, and for short circuits, Megger all circuits of 100 amp and greater rating. Correct malfunctions. Record all test data and provide written test report.
- B. Subsequent to wire and cable connections, energize circuitry and demonstrate functioning in accordance with requirements.

**3.3 IDENTIFICATION OF FEEDERS:** Refer to Section 26 0553 for requirements.

**END OF SECTION 26 0519**

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## SECTION 26 0526

### GROUNDING

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26 Basic Materials and Methods sections apply to work specified in this section.

##### 1.2 DESCRIPTION OF WORK:

- A. Provide grounding as specified herein, and as indicated on drawings.
- B. Provide grounding and bonding of all electrical and communication apparatus, machinery, appliances, building components, and items required by the NEC to provide a permanent, continuous, low impedance, grounding system.
- C. Unless otherwise indicated, ground the complete electrical installation including the system neutral, metallic conduits and raceways, boxes, fittings, devices, cabinets, and equipment in accordance with all code requirements.
- D. Ground each separately derived system, as described in NEC Section 250-30, unless otherwise indicated.
- E. Types of grounding in this section include the following:
  - 1. Underground Metal Water Piping
  - 2. Metal Building Frames
  - 3. Grounding Electrodes
  - 4. Grounding Rods
  - 5. Separately Derived Systems
  - 6. Service Equipment
  - 7. Enclosures
  - 8. Systems
  - 9. Equipment
  - 10. Other items indicated on drawings
- F. Requirements of this section apply to electrical grounding work specified elsewhere in these specifications.

##### 1.3 QUALITY ASSURANCE:

- A. Comply with NEC as applicable to electrical grounding and ground fault protection systems. Comply with applicable ANSI and IEEE requirements. Provide products that have been UL listed and labeled.
- B. Resistance from the service entrance ground bus, through the grounding electrode to earth, shall not exceed 5 ohms.

##### 1.4 SUBMITTALS:

- A. Submit the name of test agency to be used for testing specified in this section. Submit results of tests specified in this section. Also include test results in Operation and Maintenance Manuals as specified.



## **PART 2 – PRODUCTS**

### **2.1 MATERIALS AND COMPONENTS:**

- A. GENERAL: Except as otherwise indicated, provide each electrical grounding system as specified herein, and as shown on drawings, including but not necessarily limited to, cables/wires, connectors, terminals (solderless lugs), grounding rods/electrodes and plate electrodes, bonding jumper braid, and other items and accessories needed for complete installation. Where materials or components are not otherwise indicated, comply with NEC, NEMA and established industry standards for applications indicated.
- B. ELECTRICAL GROUNDING CONDUCTORS: Unless otherwise indicated, provide electrical grounding conductors for grounding connections matching power supply wiring materials and sized according to NEC. Provide with green insulation.
- C. GROUND RODS: Steel with copper welded exterior, 3/4" dia. x 10' long. Weaver or Cadweld.
- D. GROUND WELL BOXES FOR GROUND RODS: Precast concrete box 9-1/2" W. x 16" L. X 18" D. with light duty concrete cover for non-traffic areas or rated steel plate for traffic areas. Provide covers with lifting holes. Engrave cover with "GROUND ROD".
- E. CONCRETE ENCASED GROUNDING ELECTRODE (UFER GROUND): #2/0 AWG bare copper conductor.
- F. INSULATED GROUNDING BUSHINGS: Plated malleable iron body with 150 degree Centigrade molded plastic insulating throat, lay-in grounding lug with hardened stainless steel fasteners, OZ-Gedney BLG, or Thomas & Betts #TIGB series.
- G. CONNECTIONS TO PIPE: For cable to pipe, OZ-Gedney G-100B series or Thomas & Betts #390X series, or Burndy type GAR.
- H. CONNECTIONS TO STRUCTURAL STEEL, GROUND RODS, OR SPLICES: For splicing and/or connecting conductors, use exothermic welds or high pressure compression type connectors. Provide exothermic weld kits manufactured by Cadweld or Thermoweld. If high compression type connectors are used for cable-to-cable, or cable-to-steel, or cable-to-ground rod connections, provide Thomas & Betts #53000 series, or Burndy Hyground series.
- I. BONDING JUMPERS: OZ-Gedney Type BJ, or Thomas & Betts #3840 series, or Burndy type GG and type B braid.
- J. INTERSYSTEM BONDING TERMINAL: Provide one 12" L. x 2" H x 1/4" thick copper bus bar. Mount on wall adjacent to Main Electrical Service Equipment on insulating standoffs, 18" A.F.F. Furnish complete with lugs for connecting systems grounding cables. All holes shall be drilled for 2 hole compression lugs. Provide 6 spare lugs. Connect to equipment grounding bus in Main Electrical Service Equipment with No. 4 AWG copper conductor.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION OF GROUNDING SYSTEMS:**

- A. Install electrical grounding systems in accordance with manufacturer's written instructions and with recognized industry practices to ensure grounding devices comply with requirements.
- B. Install clamp-on connectors only on thoroughly cleaned and metal contact surfaces, to ensure electrical conductivity and circuit integrity.
- C. Provide grounding for the entire raceway, enclosure, equipment and device system in accordance with NEC. All non-metallic raceways shall include copper grounding conductor sized in accordance with NEC. Include copper grounding conductor in all

raceway installed in suspended slabs.

- D. Provide service entrance grounding by means of ground rods (quantity of two, driven exterior to building), by means of bonding to water main, and by means of bonding to building structural steel. In addition, provide a grounding electrode for not less than 30 lineal feet in concrete footing or foundation that is in direct contact with earth. Size electrode in accordance with NEC, but in no case, smaller than No. 4 AWG bare copper. Support electrode so as to be below finished grade near the bottom of the trench, and approximately three inches from the bottom or sides of the concrete. Locate a point of connection for inspection.
- E. Provide grounding conductors for dimming systems in accordance with manufacturer's requirement.

### **3.2 GROUNDING ELECTRODES:**

- A. Concrete Encased Grounding Electrode (UFER Ground): Provide a #2/0 AWG minimum bare copper conductor encased along the bottom of concrete foundation or footings that are in direct contact with the earth and where there is no impervious water-proofing membrane between the footing and the soil. Extend electrode through a horizontal length of 30 feet minimum and encase with not less than 2 nor more than 5 inches of concrete separating it from surrounding soils. At point of emergence from concrete, run electrode through a protective non-metallic sleeve and extend to the main building [reference] ground bus.
- B. [Supplementary Grounding Electrode (Ground Ring, Grid, and Driven Rods): Provide driven ground rod(s) installed in listed ground well box(s) and filled with gravel after connection is made. Interconnect ground rod(s) with structural steel and adjacent rods with minimum #4 AWG bare copper conductor. Locate ground rod a minimum of 10 feet from any electrode of another electrical system or from adjacent ground rod(s)].
- C. Separately Derived Electrical System Grounding Electrode: Ground each separately derived system per requirements in NEC Section 250-26 unless indicated otherwise.
- D. GROUNDING ELECTRODE CONDUCTOR: Provide grounding electrode conductor sized per NEC table 250-94 or as indicated.
- E. POWER SYSTEM GROUNDING: Connect the following items using NEC sized copper grounding conductors to lugs on the Main Building Ground Bus
  - 1. Grounding electrode conductor from concrete encased electrode, and from ground rods.
  - 2. Conductor from main incoming cold water piping system.
  - 3. Conductor from building structural steel.
  - 4. Ground for separately derived systems.
- F. Run main grounding conductors exposed or in metallic conduit if protection or concealment is required.
- G. EQUIPMENT BONDING/GROUNDING: Provide a NEC sized conductor, whether indicated or not on the drawings, in raceways as follows:
  - 1. Non-metallic conduits and ducts.
  - 2. Distribution feeders.
  - 3. Motor and equipment branch circuits.
  - 4. Device and lighting branch circuits.
  - 5. Provide grounding bushings and bonding jumpers for all conduit terminating in reducing washers, concentric, eccentric or oversized knockouts at panelboards, cabinets and gutters.

- H. Provide bonding jumpers across expansion and deflection couplings in conduit runs, across pipe connections at water meters, and across dielectric couplings in metallic cold water piping system.
- I. Provide bonding wire in all flexible conduit.

**3.3 TESTING:**

- A. Obtain and record ground resistance measurements both from service entrance ground bus to the ground electrode and from the ground electrode to earth. Install additional bonding and grounding electrodes as required to comply with resistance limits specified under this Section.
- B. Include typewritten records of measured resistance values in the Operation and Maintenance Manual.
- C. Use independent testing agency for all testing.
- D. Use test equipment expressly designed for the purpose intended. Submit name of testing agency for review and approval, in writing, to the Engineer prior to the performance of any testing.

**END OF SECTION 26 0526**

## SECTION 26 0529

### SUPPORTING DEVICES

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification section, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is a part of each Division-26, 27 and 28 section making reference to supports, anchors, sleeves, and seals, specified herein.

##### 1.2 DESCRIPTION OF WORK:

- A. Extent of supports, anchors, and sleeves is indicated by drawings and schedules and/or specified in other Division-26 sections. See Section 260532, Raceways, for additional requirements.
- B. Work of this section includes supports, anchors, sleeves and seals required for a complete raceway support system, including but not limited to: clevis hangers, riser clamps, C-clamps, beam clamps, one and two hole conduit straps, offset conduit clamps, expansion anchors, toggle bolts, threaded rods, U-channel strut systems, threaded rods and all associated accessories.

##### 1.3 QUALITY ASSURANCE:

- A. Comply with NEC as applicable to construction and installation of electrical supporting devices. Comply with applicable requirements of ANSI/NEMA Std. Pub No. FB 1, "Fittings and Supports for Conduit and Cable Assemblies". Provide electrical components that are UL-listed and labeled.

#### PART 2 - PRODUCTS

##### 2.1 MANUFACTURED SUPPORTING DEVICES:

###### A. GENERAL:

- 1. Provide supporting devices; complying with manufacturer's standard materials, design and construction in accordance with published product information, and as required for a complete installation; and as herein specified. See drawings for additional requirements.

#### PART 3 - EXECUTION

##### 3.1 INSTALLATION OF SUPPORTING DEVICES:

- A. Install hangers, anchors, sleeves, and seals as required, in accordance with manufacturer's written instructions and with recognized industry practices to ensure supporting devices comply with requirements. Comply with requirements of NECA, NEC and ANSI/NEMA for installation of supporting devices.
- B. Coordinate with other electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices with other work.
- C. Install hangers, supports, clamps and attachments to support piping properly from building structures. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible. For pre-and post tensioned

construction, use pre-set inserts for support of all electrical work. Do not use toggle bolts, moly bolts, wood plugs or screws in sheetrock or plaster as support for any equipment or raceway.

D. Independent support wires are not allowed as indicated as per NEC 300.11(B).

E. RACEWAYS:

1. Support raceways that are rigidly attached to structure at intervals not to exceed 8 feet on center, minimum of two straps per 10 foot length of raceway, and within 12" of each junction box, coupling, outlet or fitting. Support raceway at each 90° degree bend. Support raceway (as it is installed) in accordance with the following:

| <u>NUMBER OF RUNS</u> | <u>3/4" TO 1-1/4" Ø</u>         | <u>1-1/2" &amp; LARGER Ø</u> |
|-----------------------|---------------------------------|------------------------------|
| 1                     | Full straps, clamps or hangers. | Hanger                       |
| 2                     | Full straps, clamps or hangers. | Mounting Channel             |
| 3 or more             | Mounting Channel                | Mounting Channel             |

2. Support suspended raceways on trapeze hanger systems; or individually by means of threaded rod and straps, clamps, or hangers suitable for the application. Do not use "tie wire" as a portion of any raceway support system; do not support raceway from ceiling support wires.

F. FLOOR MOUNTED EQUIPMENT:

1. Provide rigid attachment of all floor mounted equipment to the floor slab or structural system. Provide 5/8" bolts or expansion anchors at each 90 degree corner and at intervals not to exceed 48" on center along entire perimeter of the equipment. Provide rigid attachment for all floor mounted switchboards, panelboards, power and control equipment, motor control centers, dimmer cabinets, transformers (provide neoprene vibrations isolators at anchor points), oil switches, battery packs and racks, and similar equipment furnished under Division 26, 27 and 28.

G. WIREWAYS, BUS DUCTS AND CABLE TRAYS:

1. Provide vertical and lateral support systems for all wireways, busway, and cable trays that are supported from overhead structure. See Sections 260536 and 262500 for additional requirements.

**END OF SECTION 26 0529**

**SECTION 26 0532**  
**CONDUIT RACEWAY**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS:**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-26 section making reference to electrical raceways and specified herein.

**1.2 DESCRIPTION OF WORK:**

- A. Extent of raceways is indicated by drawings and schedules.
- B. Division-26 is responsible to provide conduit and rough-in for all thermostat controls located within walls. Coordinate with the Controls Contractor and verify exact location of all thermostats. Obtain and review submittals of Temperature Control Equipment from Controls Contractor and Divisions 21-23.
- C. Types of raceways in this section include the following:
  - 1. Electrical Metallic Tubing
  - 2. Flexible Metal Conduit
  - 3. Intermediate Metal Conduit
  - 4. Liquid-tight Flexible Metal Conduit
  - 5. Rigid Metal Conduit
  - 6. Rigid Non-metallic Conduit

**1.3 QUALITY ASSURANCE:**

- A. **MANUFACTURERS:** Firms regularly engaged in manufacture of raceway systems of types and sizes required, whose products have been in satisfactory use in similar service for not less than three (3) years.
- B. **STANDARDS:** Comply with applicable portions of NEMA standards pertaining to raceways. Comply with applicable portions of UL safety standards pertaining to electrical raceway systems; and provide products and components that have been UL-listed and labeled. Comply with NEC requirements as applicable to construction and installation of raceway systems.

**1.4 SUBMITTALS:**

- A. Not Required.

**PART 2 – PRODUCTS**

**2.1 METAL CONDUIT AND TUBING:**

- A. **GENERAL:**
  - 1. Provide metal conduit, tubing and fittings of types, grades, sizes and weights (wall thicknesses) as indicated; with minimum trade size of 3/4".
- B. **RIGID METAL CONDUIT (RMC):** FS WW-C-0581 and ANSI C80.1.

- C. INTERMEDIATE STEEL CONDUIT (IMC): FS WW-C-581.
- D. PVC EXTERNALLY COATED RIGID STEEL CONDUIT: ANSI C80.1 and NEMA Std. Pub. No. RN 1.
- E. ALUMINUM CONDUIT: Not acceptable.
- F. ELECTRICAL NON-METALLIC TUBING (ENT) SYSTEM: Not acceptable.
- G. MC CABLE: Only acceptable as indicated below.
  - 1. MC Cable is acceptable for all branch circuits installed in gypsum wallboard walls from the home run device box to the last device box on the branch circuit and all boxes in between, from the home run device box to the branch panel, the circuit shall be installed in an approved raceway. **All MC Cable shall be provided with anti-short fittings.**
  - 2. MC Cable is acceptable for all light fixture whips not longer than six feet in length. Located in removable grid ceilings. MC Cable is unacceptable to be installed from light fixture to light fixture. **All MC Cable shall be provided with anti-short fittings.**
    - a. The use of MC-PCS cable is acceptable for light fixture whips utilizing 0-10v control schemes, not longer than 72" in length, located above removable grid ceilings. All MC cable shall be provided with anti-short fittings.
      - i. Acceptable Manufacturers
        - 1. AFC – MC Luminary Cable
        - 2. Encore – MC-LED Lighting Cable
        - 3. Southwire – MC-PCS Duo
  - 3. Before any rough-in of MC cable, the contractor shall conduct a on-site meeting with owner and engineer to review standards and overall rough-in requirements. Contractor shall conform to all owner and engineer requirements.
  - 4. Contractor mock-up one classroom for review of electrical installation prior to continuing installation of MC cabling.
- H. RIGID AND INTERMEDIATE STEEL CONDUIT FITTINGS:
  - 1. Provide fully threaded malleable steel couplings; raintight and concrete tight where required by application. Provide double locknuts and metal bushings at all conduit terminations. Install OZ Type B bushings on conduits 1-1/4" and larger.
- I. ELECTRICAL METALLIC TUBING (EMT): FS WW-C-563 and ANSI C80.3.
- J. EMT FITTINGS:
  - 1. Provide insulated throat nylon bushings with non-indenter type malleable steel fittings at all conduit terminations. Install OZ Type B bushings on conduits 1" larger. Cast or indenter type fittings are not acceptable.
- K. FLEXIBLE METAL CONDUIT: FS WW-C-566, of the following type;
  - 1. Zinc-coated steel.
- L. FLEXIBLE METAL CONDUIT FITTINGS: FS W-F-406, Type 1, Class 1, and Style A.
- M. LIQUID TIGHT FLEXIBLE METAL CONDUIT:
  - 1. Provide liquid-tight, flexible metal conduit; constructed of single strip, flexible continuous, interlocked, and double-wrapped steel; galvanized inside and outside; coated with liquid-tight jacket of flexible polyvinyl chloride (PVC).
- N. LIQUID-TIGHT FLEXIBLE METAL CONDUIT FITTINGS: FS W-F-406, Type 1, Class 3,

Style G.

O. EXPANSION FITTINGS: OZ Type AX, or equivalent to suit application.

## **2.2 NON-METALLIC CONDUIT AND DUCTS:**

A. GENERAL:

1. Provide non-metallic conduit, ducts and fittings of types, sizes and weights as indicated; with minimum trade size of 3/4".

B. UNDERGROUND PVC PLASTIC UTILITIES DUCT:

1. Minimum requirements shall be schedule 40 for encased burial in concrete and for Type II for direct burial.

C. PVC AND ABS PLASTIC UTILITIES DUCT FITTINGS:

D. ANSI/NEMA TC 9, match to duct type and material.

E. HDPE CONDUIT: Not acceptable.

## **2.3 CONDUIT; TUBING; AND DUCT ACCESSORIES:**

A. Provide conduit, tubing and duct accessories of types and sizes, and materials, complying with manufacturer's published product information, that mate and match conduit and tubing. Provide manufactured spacers in all duct bank runs.

## **2.4 SEALING BUSHINGS:**

A. Provide OZ Type FSK, WSK, or CSMI as required by application. Provide OZ type CSB internal sealing bushings.

## **2.5 CABLE SUPPORTS:**

A. Provide OZ cable supports for vertical risers, type as required by application.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION OF ELECTRICAL RACEWAYS:**

A. Install electrical raceways where indicated; in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA "Standard of Installation", and in accordance with the following:

1. SERVICE ENTRANCE CONDUCTORS, AND CONDUCTORS OVER 600 VOLTS:

a. Install in rigid metal conduit (RMC), or intermediate metal conduit (IMC); except where buried below grade, install in non-metallic conduit or duct, individually encased in concrete. See duct banks.

2. FEEDERS UNDER 600 VOLTS:

a. Install in electric metallic tubing (EMT). Below concrete slab-on-grade or in earth fill, install in non-metallic plastic conduit. In areas exposed to weather, moisture, or physical damage, install in RMC or IMC. In suspended slabs, install in EMT (NOT APPROVED).

3. BRANCH CIRCUITS, SIGNAL AND CONTROL CIRCUITS, AND INDIVIDUAL EQUIPMENT CIRCUITS RATED LESS THAN 100 AMPS:

a. Install in electric metallic tubing (EMT). Below concrete slab-on-grade or in earth fill, install in non-metallic plastic duct. In areas exposed to



weather, moisture, or physical damage, install in RMC or IMC. In suspended slabs, install in EMT (NOT APPROVED).

4. UTILITY COMPANY COORDINATION:

- a. For installation of conduits for Rocky Mountain Power (RMP) feeders provide Schedule 40 PVC with long radius sweep fiberglass elbows. Coordination RMP standards for trench width, depth and spacing from other utilities. Provide back fill material of sand, screened backfill, etc., acceptable to RMP or as specified elsewhere in these specifications, whichever is more stringent.

B. Coordinate with other work including metal and concrete deck work, as necessary to interface installation of electrical raceways and components.

C. Install raceway in accordance with the following:

1. Provide a minimum of 12" clearance measured from outside of insulation from flues, steam and hot water piping, etc. Avoid installing raceways in immediate vicinity of boilers and similar heat emitting equipment. Conceal raceways in finished walls, ceilings and floor (other than slab-on-grade), except in mechanical, electrical and/or communication rooms, conceal all conduit and connections to motors, equipment, and surface mounted cabinets unless exposed work is indicated on the drawings. Run concealed conduits in as direct a line as possible with gradual bends. Where conduit is exposed in mechanical spaces, etc., install parallel with or at right angles to building or room structural lines. Do not install lighting raceway until piping and duct work locations have been determined in order to avoid fixtures being obstructed by overhead equipment.
2. PVC conduit not allowed within CMU and block type walls.
3. The required raceway size, for any given installation, shall remain the same throughout the entire length of the run. At no point shall any conduit be reduced in size.
4. Where cutting raceway is necessary, remove all inside and outside burrs; make cuts smooth and square with raceway. Paint all field threads (or portions of raceway where corrosion protection has been damaged) with primer and enamel finish coat to match adjacent raceway surface.
5. Provide a minimum of 1 ½" from nearest surface of the roof decking to raceway.
6. In open gymnasiums, auditoriums, etc; all conduit shall be installed in straight lines parallel to, or at right angles to, the structure or adjacent building elements. Separations between conduits and fastenings of conduits shall be neat and consistent. Conduit shall be installed as tight to the bottom of structural elements when parallel to joists as code will allow. Overall installation shall be accomplished in an aesthetic and workmanlike manner. No conduits shall be allowed to run perpendicular to the bottom chord and at the bottom of the joists.
7. Provide conduit from device to device in open and/or exposed ceilings. Ceilings with clouds are considered open/exposed ceiling. No exposed cables shall be seen from below.
8. Provide a maximum of three phase conductors in any one conduit or as approved by electrical engineer. Where phase conductors share a common neutral they must have a means to simultaneously disconnect all ungrounded conductors at the point where the branch circuits originate. The ungrounded and neutral conductors of a multi-wire branch circuit must be grouped together by wire ties at the point of origination.
9. Provide neutral and ground wire as specified elsewhere in documents.

10. Provide separate neutral conductor for all single phase branch circuits installed. No shared neutrals are allowed. Neutral conductor shall be the same size as the phase conductor.
- D. Comply with NEC for requirements for installation of pull boxes in long runs.
  - E. Cap open ends of conduits and protect other raceways as required against accumulation of dirt and debris. Pull a mandrel and swab through all conduit before installing conductors. Install a 200 lb. nylon pull cord in each empty conduit run.
  - F. Replace all crushed, wrinkled or deformed raceway before installing conductors.
  - G. Do not use flame type devices as a heat application to bend PVC conduit. Use a heating device that supplies uniform heat over the entire area without scorching the conduit.
  - H. Provide rigid metal conduit (RMC) for all bends greater than 22 degrees in buried conduit. Provide protective coating for RMC bend as specified herein.
  - I. Where raceways penetrate building, area ways, manholes or vault walls and floors below grade, install rigid metal conduit (RMC) for a minimum distance of 10 feet on the exterior side of the floor or wall measured from interior face. Provide OZ, Type FSK, WSK or CSMI sealing bushings (with external membrane clamps as applicable) for all conduit penetrations entering walls or slabs below grade. Provide segmented type CSB internal sealing bushings in all raceways penetrating building walls and slabs below grade, and in all above grade raceway penetrations susceptible to moisture migration into building through raceway.
  - J. Install liquid-tight flexible conduit for connection of motors, transformers, and other electrical equipment where subject to movement and vibration.
  - K. Install spare 3/4" conduits (capped) from each branch panelboard into the ceiling and floor space. Run five into the ceiling space and five into the floor space. Where the floor is not accessible run six conduits into the ceiling space. Run conduits the required distance necessary to reach accessible ceiling space.
  - L. Provide OZ expansion fittings on all conduits crossing building expansion joints, both in slab and suspended.
  - M. Provide OZ cable supports in all vertical risers in accordance with NEC 300-19; type as required by application.
  - N. Complete installation of electrical raceways before starting installation of cables/conductors within raceways.
  - O. Raceway installation below grade:
    1. Apply protective coating to metallic raceways in direct contact with earth or fill of any type; consisting of spirally wrapped PVC tape (1/2" minimum overlap of scotch wrap tape or equal); or factory applied vinyl cladding (minimum thickness .020 inches). Completely wrap and tape all field joints.
    2. Burial depths must comply with NEC Section 300-5 but in no case be less than 24", unless noted otherwise on drawings.
    3. Utility burial depths must comply with RMP requirements or AHJ, but in no case be less than 48" minimum, unless noted otherwise on drawings, diagrams etc.
  - P. Raceway installation below slab-on-grade, or below grade:
    1. For slab-on-grade construction, install runs of rigid plastic conduit (PVC) below slab. All raceway shall be located a at top of sub-grade and a minimum of 6" below bottom of slab. Stake down conduits as required to keep conduits from floating or moving. Coordinate strictly with other trades at grade level structural members for correct installation. Install RMC (with protective coating) for

raceways passing vertically through slab-on-grade. Slope raceways as required to drain away from electrical enclosures and to avoid collection of moisture in raceway low points.

2. Apply protective coating to metallic raceways in direct contact with earth or fill of any type; consisting of spirally wrapped PVC tape (1/2" minimum overlap of scotch wrap tape or equal); or factory applied vinyl cladding (minimum thickness .020 inches). Completely wrap and tape all field joints.
  3. Mark all buried conduits that do not require concrete encasement by placing yellow plastic marker tape (minimum 6" wide) along entire length of run 12" below final grade. Where multiple small lines are buried in a common trench and do not exceed an overall width of 16", install a single line marker.
  4. Burial depths must comply with NEC Section 300-5 but in no case be less than 24", unless noted otherwise on drawings.
  5. Do not locate utility feeds under any structure. Verify all utility power paths with RMP prior to any rough-in. Utility burial depths must comply with RMP requirements or AHJ, but in no case be less than 48" minimum, unless noted otherwise on drawings, diagrams etc.
- Q. Raceway installation in suspended slabs:
1. No conduit can be installed in suspended slabs.
- R. Raceway installation in hazardous locations:
1. Install RMC in all hazardous locations as defined by NEC. Provide suitable fittings, seal-offs, boxes, etc. to comply with requirements.
  2. Engage at least five full threads on all fittings. Provide inspection fittings with explosion proof drains to prevent water accumulation in conduit runs. Install seal-offs for arcing or high temperature equipment, at housing with splices or taps and where conduits enter or leave the hazardous area. Provide seal-offs of the appropriate type for vertical or horizontal installation. Ground all metallic parts.
- S. DUCTBANKS:
1. Provide ductbank construction as indicated using 3000 psi at 28 day strength concrete. Use Type II low alkali per ASTM C150. Use ASTM C-33 aggregate gradation with maximum size of 3/4". Use W/C ratio of 0.50. Install #4 reinforcing bar per ASTM 615 grade 50 in each corner of ductbank. Provide minimum 4" concrete cover on all sides of exterior conduits. Provide polypropylene pull rope in all spare duct.
- T. Electrical Identification: Refer to Section 260553 for requirements.

**END OF SECTION 26 0532**

## SECTION 26 0533

### ELECTRICAL BOXES AND FITTINGS

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specifications sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is a part of each Division-26, 27 and 28 section making reference to electrical wiring boxes and fittings specified herein. See Section 260532, Raceways, for additional requirements.

##### 1.2 DESCRIPTION OF WORK:

- A. The extent of electrical box and electrical fitting work is indicated by drawings and schedules.
- B. Types of electrical boxes and fittings in this section include the following:
  - 1. Outlet Boxes
  - 2. Junction Boxes
  - 3. Pull Boxes
  - 4. Floor Boxes
  - 5. Conduit Bodies
  - 6. Bushings
  - 7. Locknuts
  - 8. Knockout Closures
  - 9. Miscellaneous Boxes and Fittings

##### 1.3 QUALITY ASSURANCE:

- A. Comply with NEC as applicable to construction and installation of electrical boxes and fittings. Comply with ANSI C 134,1 (NEMA Standards Pub No. OS 1) as applicable to sheet-steel outlet boxes, device boxes, covers and box supports. Provide electrical boxes and fittings that have been UL-listed and labeled.

##### 1.4 SUBMITTALS:

- A. Submit manufacturer's data including specifications, installation instruction and general recommendations for each type of floor box used on project.

#### PART 2 - PRODUCTS

##### 2.1 FABRICATED MATERIALS:

- A. INTERIOR OUTLET BOXES:
  - 1. Provide one piece, galvanized flat rolled sheet steel interior outlet wiring boxes with accessory rings, of types, shapes and sizes, including box depths, to suit each respective location and installation, construct with stamped knockouts in back and sides, and with threaded screw holes with corrosion-resistant screws for securing box and covers and wiring devices; minimum size 4"x4"x2-1/8".

2. Provide an 'FS' box, with no knockouts when surface mounted in a finished, non-utility space. Surface mounting is only acceptable when approved by the Architect.
- B. INTERIOR OUTLET BOX ACCESSORIES:
1. Provide outlet box accessories as required for each installation, including mounting brackets, hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, that are compatible with outlet boxes being used and fulfilling requirements of individual wiring applications.
- C. WEATHERPROOF OUTLET BOXES:
1. Provide corrosion-resistant cast-metal weatherproof outlet wiring boxes, of types, shapes and sizes (including depth) required, with threaded conduit ends, cast-metal face plates with spring-hinged waterproof caps suitably configured for each application, with face plate gaskets and corrosion-resistant fasteners.
- D. JUNCTION AND PULL BOXES:
1. Provide code-gage sheet steel junction and pull boxes, with screw-on covers; of types, shapes and sizes to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers.
- E. FLOOR BOXES:
1. Single Service Floor Box: Provide leveling and fully adjustable floor service receptacle outlets and fittings of types and ratings indicated; and with finish as selected by Architect. Equip with wiring devices as specified in Section 262726. Provide boxes compatible with floor system; provide epoxy-coated stamped steel boxes or cast iron boxes for slab-on-grade construction; provide stamped steel boxes for suspended slabs. Equip with tile and/or carpet flanges to accommodate floor finish material. Boxes shall be available in one, two or three gang configurations. Boxes shall comply with UL Standard UL514A.
  2. Multi-Service Floor Box: Provide leveling and fully adjustable multi compartment floor box; there shall be multiple independent wiring compartments; the floor box shall permit tunneling from end power compartment to end power compartment. Floor box shall accommodate a minimum of two duplex receptacles and two mounting plates for telecommunication devices. Equip with wiring devices as specified in Section 262726. Provide boxes compatible with floor system; with finish as selected by Architect. Provide epoxy-coated stamped steel boxes or cast-iron boxes for slab-on-grade construction; provide stamped steel boxes for suspended slabs. Equip with tile and/or carpet flanges to accommodate floor finish material. Boxes shall comply with UL Standards UL514A and/or UL514C.
  3. Manufacturer: subject to compliance with requirements, provide floor boxes as indicated on the drawings.
    - a. Harvey Hubbell, Inc.
    - b. Wiremold
- F. CONDUIT BODIES:
1. Provide galvanized cast-metal conduit bodies, of types, shapes and sizes to suit respective locations and installation, construct with threaded-conduit-entrance ends, removable covers, and corrosion-resistant screws.
- G. BUSHINGS, KNOCKOUT CLOSURES AND LOCKNUTS:
1. Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts and malleable steel conduit bushings and offset connectors, of types and sizes to suit respective uses and installation.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION OF ELECTRICAL BOXES AND FITTINGS:**

#### **A. GENERAL:**

1. Install electrical boxes and fittings where indicated, complying with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.
2. Coordinate installation of electrical boxes and fittings with wire/cable and raceway installation work.
3. Provide coverplates for all boxes. See Section 262726, Wiring Devices.
4. Provide weatherproof outlets for interior and exterior locations exposed to weather or moisture.
5. Provide knockout closures to cap unused knockout holes where blanks have been removed.
6. Install boxes and conduit bodies to ensure ready accessibility of electrical wiring. Do not install boxes above ducts or behind equipment. Install recessed boxes with face of box or ring flush with adjacent surface. Seal between switch, receptacle and other outlet box openings and adjacent surfaces with plaster, grout, or similar suitable material.
7. Fasten boxes rigidly to substrates or structural surfaces, or solidly embed electrical boxes in concrete or masonry. Use bar hangers for stud construction. Use of nails for securing boxes is prohibited. Set boxes on opposite sides of common wall with minimum 10" of conduit between them. Set boxes on opposite sides of fire resistant walls with minimum of 24" separation.
8. Provide a minimum of 1 ½" from the nearest surface of the roof decking to the installed boxes.
9. Provide electrical connections for installed boxes.

**END OF SECTION 26 0533**

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**SECTION 26 0536**  
**RACEWAY SYSTEMS**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS:**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-26 Section making reference to electrical raceways specified herein.

**1.2 DESCRIPTION OF WORK:**

- A. Extent of raceways is indicated by drawings and schedules.
- B. Types of raceways in this section include the following:
  - 1. Surface metal raceways
  - 2. Wire basket cable tray systems.

**1.3 QUALITY ASSURANCE:**

- A. STANDARDS:
  - 1. Comply with applicable portions of NEMA standards pertaining to raceways. Comply with applicable portions of UL safety standards pertaining to electrical raceway systems; and provide products and components that have been UL-listed and labeled. Comply with NEC requirements as applicable to construction and installation of raceway systems.
  - 2. Comply with the following publications and standards for construction and installation or wire basket cable tray:
    - a. Comply with NEC Article 392
    - b. NEMA VE-1; NEMA VE-2-2001
    - c. NFPA 70B
    - d. ASTM B633; ASTM A653; ASTM A510

**1.4 SUBMITTALS:**

- A. Refer to section 26 0502 submittal requirements.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURED RACEWAY SYSTEMS:**

- A. GENERAL:
  - 1. Provide electrical raceways of types, grades, sizes, weights [wall thicknesses], and number of channels, for each service indicated. Provide complete assembly of raceway including, but not necessarily limited to, couplings, offsets, elbows, expansion joints, adapters, holddown straps, end caps, and other components and accessories as needed for complete system.
- B. SURFACE METAL RACEWAYS:



1. Provide galvanized steel surface metal raceways of sizes and channels indicated. Provide fittings indicated that match and mate with raceway. Paint with manufacturer's standard prime coating and finish color as indicated. Provide receptacles on centers as indicated on drawings or as directed by engineer.
  2. MANUFACTURER:
    - a. Subject to compliance with requirements, provide surface metal raceways of one of the following:
      - i. Wiremold Company AL3300
- C. WIRE BASKET CABLE TRAY SYSTEMS:
1. Refer to specification 27 1010 for information relating to the school districts standards for cable tray installation.
  2. MANUFACTURER:
    - a. Subject to compliance with requirements, provide cable tray system of one of the following (OR APPROVED EQUAL):
      - i. Cooper B-Line WB400 Series Systems
  3. Provide wire basket cable tray of types, grades, ratings, and sizes as specified and indicated meeting all requirements of NEMA VE-1. Provide complete assembly of raceway including, but not necessarily limited to, offsets, adapters, connector plates, splice plates, brackets, connector assemblies, holddown clamp assemblies, grounding clamps and other components and accessories as needed for complete system.
  4. WIRE BASKET: Wire basket shall be made of high strength steel wires conforming to ASTM A510, and formed into a standard 2 inch by 4 inch wire mesh pattern with intersecting wires welded together. All wire ends along wire basket sides (flanges) shall be rounded during manufacturing for safety of cables and installers.
    - a. All straight section longitudinal wires shall be straight, with no bends.
    - b. Straight sections shall be furnished in standard 118 inch lengths.
    - c. Wire basket shall have a 4 inch usable loading depth by 20 inches wide.
    - d. Wire basket shall be electro-plated zinc in accordance with ASTM B633 SC2, with clear chromate sealer.
    - e. Wire basket shall have a load capacity of 116 lbs per foot based on 5 foot spacing between supports.
  5. BENDS: Horizontal and vertical bends, and horizontal tees shall be field formed. Inside radius of field bends shall be no less than 12 inches, and in no case smaller than required to comply with minimum radius requirement of cable manufacturer. Horizontal bends and tees shall be made such that the side rail of the tray is continuous with no gaps.
  6. SPLICE ASSEMBLIES: Splice assemblies shall consist of splice plates and clamp/connectors furnished by the tray system manufacturer as standard components of the system. Splice assemblies shall be used to join separate horizontal sections together. Splice plates shall be approximately 2.7 inches long by 1.6 inches high, zinc-plated. Clamp/connectors shall be the bolted type consisting of welded stud plates with threaded studs and serrated flanged locknuts. Hardware shall be zinc-plated.
  7. ACCESSORIES AND COMPONENTS: Support accessories shall be zinc-plated in accordance with ASTM B633 SC3. All threaded components shall be coated in accordance with ASTM B633 SC1.

8. Provide all fittings including connector plates, splice plates, clamps, supports, etc.
9. Grind all rough edges, drip concentrations, etc., to smooth finish. Apply cold zinc spray to all field cut surfaces.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION OF ELECTRICAL RACEWAYS:**

- A. Install electrical raceways where indicated; in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA "Standard of Installation", and complying with recognized industry practices.
- B. Provide a minimum of (4) 4" trade size Hilti Speedsleeves (or STI EZPath) with at least one spare for each and every firewall penetration where cable tray meets the wall.
- C. Provide a minimum of (4) 4" trade size conduits within cable where inaccessible ceilings that span more than 12'.
- D. Coordinate with other work including metal and concrete deck work, as necessary to interface installation of electrical raceways and components.
- E. Seal joints of underfloor ducts with sealing compound or tape prior to placing concrete.
- F. Level and square raceway runs, and install at proper elevations/heights.

#### **3.2 ADJUSTING AND CLEANING:**

- A. Upon completion of installation of raceways, inspect interiors of raceways; remove burrs, dirt and construction debris.

**END OF SECTION 26 0536**

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## SECTION 26 0548

### ELECTRICAL SEISMIC CONTROL

#### PART 1 – GENERAL

##### 1.1 WORK INCLUDED:

- A. Anchorage and seismic restraint systems for all Division 26 isolated and non-isolated equipment, cable tray, and conduit systems.
- B. Equipment/cable tray/conduit to isolated and/or seismically supported shall include but not be limited to the following:
  - 1. Conduit
  - 2. Cable Tray
  - 3. Light Fixtures

##### 1.2 RELATED WORK:

- A. Requirements: Provide Electrical Seismic Control in accordance with the Contract Documents.
- B. Section 26 0500 – Electrical General Provisions

##### 1.3 REFERENCES:

- A. International Building Code, Current Edition in use by Jurisdictional Authority.
- B. NFPA Bulletin 90A, Current Edition.
- C. UL Standard 181.

##### 1.4 SYSTEM DESCRIPTION

- A. The Division 26 Contractor shall be responsible for supplying and installing equipment, vibration isolators, flexible connections, rigid steel frames, anchors, inserts, hangers and attachments, supports, seismic snubbers and bracing to comply with the following:
  - 1. Short period design spectral response acceleration coefficient  $SDS=0.70$ .
  - 2. One second period design spectral response acceleration coefficient  $SD1=0.28$ .
  - 3. Site Class B.
  - 4. Seismic Design Category D.

##### 1.5 QUALITY ASSURANCE:

- A. All supports, hangers, bases, anchorage and bracing for all isolated equipment and non-isolated equipment shall be designed by a professional engineer licensed in the state where the project is located, employed by the restraint manufacturer, qualified with seismic experience in bracing for electrical equipment. Shop drawings submitted for earthquake bracing and anchors shall bear the Engineer's signed professional seal. All calculations/design work required for the seismic anchorage and restraint of all Division 26 equipment and systems shall be provided by a single firm.
- B. The above qualified seismic engineer shall determine specific requirements for equipment anchorage and restraints, locations and sizes based on shop drawings for the electrical equipment that have been submitted, reviewed and accepted by the

Architect/Engineer for this project.

- C. Seismic Engineer or the Engineer's Representative shall field inspect final installation and certify that bracing and anchorage are in conformance with the Seismic Engineer's design. A certificate of compliance bearing the Seismic Engineer's signed Professional Engineer's seal shall be submitted and shall be included in each copy of the Operation and Maintenance Manuals.
- D. The Division 26 Contractor shall require all equipment suppliers furnish equipment that meets the seismic code, with bases/skids/curb designed to receive seismic bracing and/or anchorage. All isolated and non-isolated electrical equipment bracing to be used in the project shall be designed from the Equipment Shop Drawings and certified correct by the equipment manufacturer for seismic description listed in Paragraph 1.4 above, with direct anchorage capability.

#### **1.6 SUBMITTALS:**

- 1. Refer to Section 26 0502 for electrical submittal requirements.

#### **PART 2 – PRODUCTS:**

##### **2.1 RESTRAINT EQUIPMENT AND SYSTEMS:**

- A. Acceptable Manufacturers and Suppliers for Non-Isolated Systems:
  - 1. Mason Industries, Inc.
  - 2. Korfund
  - 3. Amber/Booth Company
  - 4. Vibration Mountings and Control Company
  - 5. Kinetics
  - 6. International Seismic Application Technology
  - 7. Tolco
- B. Manufacture and design of restraints and anchors for isolated equipment shall be by the manufacturer of the vibration isolators furnished for the equipment.

##### **2.2 SNUBBERS:**

- A. Snubbers shall be all-directional and consist of interlocking steel members restrained by replaceable shock absorbent elastomeric materials a minimum of 3/4 inch thick.
- B. Snubbers shall be manufactured with an air gap between hard and resilient material of not less than 1/8 inch or more than 1/4 inch.
- C. Snubbers shall be Mason Industries Z -1011 or accepted equivalent.

#### **PART 3 – EXECUTION**

##### **3.1 DESIGN AND INSTALLATION:**

- A. General:
  - 1. All electrical equipment cable tray and conduit shall be braced, anchored, snubbed or supported to withstand seismic disturbances in accordance with the criteria of this specification. Provide all engineering, labor, materials, and equipment for protection against seismic disturbances as specified herein. The following electrical components are exempt from seismic restraint requirements.
    - a. Components in Seismic Design Categories A and B (see 1.4 above).
    - b. Components in Seismic Design Category C (see 1.4 above) that have an important factor IP of 1.0 (see 1.4 above).

- c. Components that have an importance factor IP of 1.0 (see 1.4 above), that are mounted less than four feet above the floor, that weigh less than 400 pounds, and that have flexible ductwork, piping, and conduit connections.
    - d. Components that have an importance factor IP of 1.0 (see 1.4 above), that weigh 20 pounds or less, and that have flexible ductwork, piping, and conduit connections.
  - 2. Powder-actuated fasteners (shot pins) shall not be used for component anchorage in tension applications in Seismic Design Category D, E, or F.
  - 3. Attachments and supports for electrical equipment shall meet the following provisions:
    - a. Attachments and supports transferring seismic loads shall be constructed of materials suitable for the application and designed and constructed in accordance with a nationally recognized structural code such as, when constructed of steel, AISC, Manual of Steel Construction (Ref. 9.8-1 or 9.8-2).
    - b. Friction clips shall not be used for anchorage attachment.
    - c. Expansion anchors shall not be used for electrical equipment rated over 10 hp (7.45 kW). Exception: Undercut expansion anchors.
    - d. Drilled and grouted-in-place anchors for tensile load applications shall use either expansive cement or expansive epoxy grout.
    - e. Supports shall be specifically evaluated if weak-axis bending of light-gauge support steel is relied on for the seismic load path.
    - f. Components mounted on vibration isolation systems shall have a bumper restraint or snubber in each horizontal direction. The design force shall be taken as 2Fp. The intent is to prevent excessive movement and to avoid fracture of support springs and any non-ductile components of the isolators.
    - g. Seismic supports shall be constructed so that support engagement is maintained.
- B. Spring Isolated Equipment:
  - 1. All vibration isolated equipment shall be mounted on rigid steel frames or concrete bases as described in the vibration control specifications unless the equipment manufacturer certified direct attachment capability. Each spring mounted base shall have a minimum of four all-directional seismic snubbers that are double acting and located as close to the vibration isolators as possible to facilitate attachment both to the base and the structure. Snubbers shall be installed with factory set clearances.
- C. Non-Isolated Equipment:
  - 1. The section 260548 (Electrical Seismic Control) Contractor shall be responsible for thoroughly reviewing all drawings and specifications to determine all equipment to be restrained. This Contractor shall be responsible for certifying that this equipment is mounted and braced such that it adheres to the system description criteria in part 1.04 of this specification section.
- D. Conduit:
  - 1. Seismic braces for conduit may be omitted when the distance from the top of the conduit to the supporting structure is 12" or less.
  - 2. A rigid conduit system shall not be braced to dissimilar parts of a building or two dissimilar building systems that may respond in a different mode during an

earthquake. Examples: Wall and a roof; solid concrete wall and a metal deck with lightweight concrete fill.

3. Unbraced conduit attached to in-line equipment shall be provided with adequate flexibility to accommodate differential displacements.
4. At the interface of adjacent structures or portions of the same structure that may move independently, utility lines shall be provided with adequate flexibility to accommodate the anticipated differential movement between the ground and the structure.
5. Provide large enough pipe sleeves through wall or floors to allow for anticipated differential movements.

E. Cable Tray:

1. Seismic restraints are not required for cable tray with importance factor IP of 1.0, provided that the following condition is met for the full length of each cable tray.
  - a. Cable trays are suspended from rod hangers and hangers that are 12" or less in length from the point rod attaches to tray, to the point rod connects to the supporting structure. Rods must be secured to both top and bottom cross angles with locking nuts above and below angle iron.

**END OF SECTION 26 0548**

## SECTION 26 0553

### ELECTRICAL IDENTIFICATION

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Requirements of the following Division 26 Sections apply to this section:
  - 1. "Basic Electrical Requirements".
  - 2. "Basic Electrical Materials and Methods".

##### 1.2 SUMMARY

- A. This section includes identification of electrical materials, equipment and installations. It includes requirements for electrical identification components including but not limited to the following:
  - 1. Buried electrical line warnings.
  - 2. Identification labels for raceways, cables and conductors.
  - 3. Operational instruction signs.
  - 4. Warning and caution signs.
  - 5. Equipment labels and signs.
  - 6. Arc-flash hazard labels
- B. Related Sections: The following sections contain requirements that relate to this section:
- C. Division 9 Section "Painting" for related identification requirements.
- D. Refer to other Division 26 sections for additional specific electrical identification associated with specific items.

##### 1.3 QUALITY ASSURANCE

- A. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code"

##### 1.4 SUBMITTALS:

- 1. Refer to Section 26 0502 for electrical submittal requirements.

#### PART 2 – PRODUCTS

##### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 1. American Labelmark Co.
  - 2. Calpico, Inc.
  - 3. Cole-Flex Corp.
  - 4. Emed Co., Inc.
  - 5. George-Ingraham Corp.



6. Ideal Industries, Inc.
7. Kraftbilt
8. LEM Products, Inc.
9. Markal Corp
10. National Band and Tag Co.
11. Panduit Corp.
12. Radar Engineers Div., EPIC Corp.
13. Seton Name Plate Co.
14. Standard Signs, Inc.
15. W.H Brady, Co.

## 2.2 ELECTRICAL IDENTIFICATION PRODUCTS

- A. Colored Conduit Systems for raceway identification:
  1. Factory-painted conduit and/or factory-painted couplings and fittings
- B. Colored paint for raceway identification:
  1. Use [Kwal Paint](#) colors as specified in Part 3 – Execution.
- C. Color Adhesive Marking Tape for Raceways, Wires and Cables:
  1. Self-adhesive vinyl tape not less than 3 mills thick by 1” to 2” in width.
- D. Underground Line Detectable Marking Tape:
  1. Permanent, bright colored, continuous-printed, acid- and alkali-resistant plastic tape specifically compounded for direct-burial service. Not less than 6” wide by 4 mills thick.
  2. With metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep.
  3. Printed legend indicative of general type of underground line below.
- E. Wire/Cable Designation Tape Markers:
  1. Vinyl or vinyl-cloth, self-adhesive, wraparound, cable/conductor markers with pre-printed numbers and letters.
- F. Brass or Aluminum Tags:
  1. Metal tags with stamped legend, punched for fastener.
  2. Dimensions: 2” X 2” 19 gage.
- G. Engraved, Plastic Laminated Labels, Signs and Instruction Plates:
  1. Engraving stock plastic laminate, 1/16” minimum thickness for signs up to 20 sq. in. or 8” in length; 1/8 “ thick for larger sizes. Engraved legend in 1/4” high white letters on black face and punched for mechanical fasteners.
- H. Arc-flash Hazard Labels:
  1. ANSI Z535.4 Safety Label.
  2. Adhesive backed polyester with self-laminating flap. Chemical, abrasion and heat resistant.
  3. Dimensions: 5” x 3.5”
  4. Information contained: Arc-flash boundary; Voltage; Flash Hazard Category; Incident Energy (arc rating); checkboxes for the required Personal Protective Equipment (PPE) and the date that the calculations were performed.
- I. Equipment Labels:

1. Adhesive backed polyester with self-laminating flap. Chemical, abrasion and heat resistant.
  2. Dimensions: minimum 5" x 2"
  3. Conductor-Identification-Means Labels:
    - a. Information contained: the method utilized for identifying ungrounded conductors within switchboards, distribution panels and branch circuit panels.
  4. Available-Fault-Current Labels:
    - a. Information contained: maximum available fault current at the respective piece of equipment, and date of calculation of fault current.
  5. Source-of-Supply Labels:
    - a. Information contained: indicate the device or equipment where the power supply originates.
- J. Baked Enamel Warning and Caution Signs for Interior Use:
1. Preprinted aluminum signs, punched for fasteners, with colors legend and size appropriate to location.
- K. Fasteners for Plastic-Laminated and Metal Signs:
1. Self-tapping stainless steel screws or # 10/32 stainless steel machine screws with nuts, flat and lock washers.
- L. Cable Ties:
1. Fungus-inert, self-extinguishing, one-piece, self-locking nylon cable ties, 0.18" minimum width, 50-lb. Minimum tensile strength, and suitable for a temperature range from minus 40° F. to 185° F. Provide ties for specified colors when used for color coding.

## **PART 3 – EXECUTION**

### **3.1 INSTALLATION**

- A. Lettering and Graphics:
1. Coordinate names, abbreviations, colors and other designations used in electrical identification work with corresponding designations specified or indicated. Install numbers, lettering and colors as approved in submittals and as required by code.
- B. Install identification devices in accordance with manufacturer's written instructions and requirements of NEC.
- C. Sequence of Work:
1. Where identification is to be applied to surfaces that require a finish, install identification after completion of finish work.
- D. Conduit Identification:
1. Identify Raceways of Certain Systems with Color Coding. Acceptable means of color identification are as follows:
    - a. Colored adhesive marking tape.
    - b. Field-painted colored bands.
    - c. Factory-painted conduit.
    - d. Color exposed or accessible raceways of the following systems for identification. Make each color band 2 inches wide, completely encircling conduit. Apply bands at changes in direction, at penetrations of walls and

floors, and at 20-foot maximum intervals in straight runs. Apply the following colors:

- i. Fire Alarm System: Red
- ii. AV/Intercom: Grey
- iii. Telephone/Data: Blue
- iv. Security: Grey
- v. Elevator Phone: Orange
- vi. Legally Required Emergency Systems: Orange (Per NEC 700.10(A))

2. Identify Junction, Pull and Connection Boxes.

- a. Code-required caution sign for boxes shall be pressured-sensitive, self-adhesive label indication system voltage in black, preprinted on orange background. Install on outside of box cover. Also label box covers on outside of cover with identity of contained circuits. Use pressure-sensitive plastic labels at exposed locations and similar labels or plasticized card stock tags at concealed boxes.

3. Label and paint the covers of the systems junction boxes as follows:

| <u>SYSTEM</u>              | <u>COLOR (ALL COLORS ARE KWAL PAINT)</u> |        |
|----------------------------|--|--------|
| Fire Alarm                 | Red Alert                                | AC118R |
| AV/Intercom                | Grey                                     |        |
| Data                       | Neon Blue                                | 7076A  |
| Security                   | Grey                                     |        |
| Legally Required EM System | Orange                                   |        |

E. Underground Electrical Line Identification.

- 1. During trench backfilling, for exterior underground power, signal, and communications lines, install continuous underground line detectable marking tape, located directly above line at 6 to 8 inches below finished grade. Where multiple lines are installed in a common trench or concrete envelope, do not exceed an overall width of 16 inches; install a single line marker.
- 2. Install detectable marking tape for all underground wiring, both direct-buried and in raceway.
- 3. Provide red marker dye applied to concrete encased ductbank.

F. Conductor Color Coding.

- 1. Provide color coding for secondary service, feeder and branch circuit conductors throughout the project secondary electrical system as follows:

| <u>120/208 Volts</u> | <u>Phase</u> | <u>277/480 Volts</u> |
|----------------------|--------------|----------------------|
| Black                | A            | Brown                |
| Red                  | B            | Orange               |
| Blue                 | C            | Yellow               |
| White                | Neutral      | Gray                 |
| Green                | Ground       | Green                |

2. Switch legs, travelers and other wiring for branch circuits shall be of colors other than those listed above.
  3. Use conductors with color factory applied the entire length of the conductors except as follows:
    - a. The following field-applied color-coding methods may be used in lieu of factory-coded wire for sizes larger than No. 10 AWG.
    - b. Apply colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply the last two laps of tape with no tension to prevent possible unwinding. Use 1-inch-wide tape in colors as specified. Do not obliterate cable identification markings by taping. Tape locations may be adjusted slightly to prevent such obliteration.
    - c. In lieu of pressure-sensitive tape, colored cable ties may be used for color identification. Apply three ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart. Apply with a special tool or pliers, tighten for snug fit, and cut off excess length.
- G. Power Circuit Identification.
1. Securely fasten identifying metal tags or aluminum wraparound marker bands to cables, feeders, and power circuits in vaults, pull boxes, junction boxes, manholes, and switchboard rooms with 1/4-inch steel letter and number stamps with legend to correspond with designations on Drawings. If metal tags are provided, attach them with approximately 55-lb monofilament line or one-piece self-locking nylon cable ties.
  2. Tag or label conductors as follows:
    - a. Future Connections: Conductors indicated to be for future connection or connection under another contract with identification indicating source and circuit numbers.
    - b. Multiple Circuits: Where multiple branch circuits or control wiring or communications/ signal conductors are present in the same box or enclosure (except for three-circuit, four-wire home runs), label each conductor or cable. Provide legend indicating source, voltage, circuit number, and phase for branch circuit wiring. Phase and voltage of branch circuit wiring may be indicated by mean of coded color of conductor insulation. For control and communications/signal wiring, use color coding or wire/cable marking tape at terminations and at intermediate locations where conductors appear in wiring boxes, troughs, and control cabinets. Use consistent letter/number conductor designations throughout on wire/cable marking tapes.
  3. Match identification markings with designations used in panelboards shop drawings, Contract Documents, and similar previously established identification schemes for the facility's electrical installations.
- H. Apply warning, caution and instruction signs and stencils as follows:
1. Install warning, caution, or instruction signs where required by NEC, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions or explanations are needed for system or equipment operation. Install butyrate signs with metal backing for outdoor items. Warning and caution signs shall be furnished and installed on, but not be limited to the following equipment and locations:

- a. Entrances to rooms and other guarded locations that contain exposed live parts 600 volts or less; signs shall forbid unqualified personnel to enter.
  - b. Switch and Overcurrent device enclosures with splices, taps and feed-through conductors. Provide warning label on the enclosures that identifies the nearest disconnecting means for any feed-through conductors.
  - c. Entrances to buildings, vaults, rooms or enclosures containing exposed live parts or exposed conductors operating at over 600 volts: DANGER-HIGH VOLTAGE-KEEP OUT.
  - d. Metal-enclosed switchgear, unit substations, transformers, enclosures, pull boxes, connection boxes and similar equipment operating at over 600 volts shall have appropriate caution signs and warning labels.
  - e. Indoor and Outdoor substations operating over 600 volts. Provide warning signs, instructional signs and single-line diagrams in accordance with NEC 225.70.
- I. Emergency Operating Signs: Install engraved laminated signs with white legend on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding, or other emergency operations.
- J. Install equipment/system circuit/device identification as follows:
- 1. Apply equipment identification labels of engraved plastic-laminate on each major unit of electrical equipment in building, including central or master unit of each electrical system. This includes communication/signal/alarm systems, unless unit is specified with its own self-explanatory identification. Except as otherwise indicated, provide single line of text, with 1/4"-high lettering on 1-inch-high label (1 1/2-inch-high where two lines are required) white lettering in black field. White lettering in red field for Emergency Power Systems. Text shall match terminology and numbering of the Contract Documents and shop drawings. Apply labels for each unit of the following categories of electrical equipment.
    - a. Each service disconnect, to identify it as a service disconnect.
    - b. Panelboards (exterior and interior), electrical cabinets, and enclosures. For subpanels, identify feeder circuit served from.
    - c. Switches in fusible panelboards shall be labeled. Main switches shall be identified.
    - d. Access doors and panels for concealed electrical items.
    - e. Electrical switchgear and switchboards.
    - f. Motor control centers.
    - g. Motor starters, including circuit origination, HP, heater size, FLA, and mechanical equipment designation.
    - h. Disconnect switches.
    - i. Pushbutton stations.
    - j. Power transfer equipment.
    - k. Contactors.
    - l. Dimmers.
    - m. Control devices.
    - n. Transformers.
    - o. Power generating units, to include transfer switches.
    - p. Telephone switching equipment.

- q. Clock/program master equipment.
  - r. Call system master station.
  - s. TV/AV equipment.
  - t. Fire alarm master station or control panel.
  - u. Variable frequency drives.
  - v. Lighting Control Equipment.
  - w. Uninterruptable Power Supply.
- K. Post Conductor-Identification-Means labels at locations of switchboards, distribution panels and branch circuit panels. The labels shall identify the color-coding used on ungrounded conductors for each voltage system used on the premises.
- L. Apply Available-Fault-Current labels at the service entrance equipment.
- M. Apply Source-of-Supply labels on the exterior covers of equipment (except in single- or two-family dwellings) as follows:
- 1. Each switchboard supplied by a feeder.
  - 2. Each branch circuit panelboard supplied by a feeder.
  - 3. Each disconnect switch serving elevators, escalators, moving walks, chairlifts, platform lifts and dumbwaiters.
  - 4. Each dry type transformer (or primary-side disconnect switch at transformer). If the primary-side disconnect is remote from the transformer, both the remote disconnect and the transformer shall be labeled, and the transformer label shall also indicate the location of the disconnect.
  - 5. Each feeder disconnect, branch circuit disconnect, panelboard or switchboard in a remote building or structure.
  - 6. Each on-site emergency power source, with sign placed at service entrance equipment to comply with NEC 700.
- N. The label shall identify the device or equipment where the power supply originates, and the system voltage, phase or line and system at all termination, connection and splice points. For example: Feeder Power Supply for Panel "XX" Originates at Panel "XX" (or Switchboard "XX", Transformer "XX", Switch "XX", etc.); 120/208 volts, 3-phase, Phase Color Identification (or 120/240, 277/480, etc.).
- O. Install Arc-flash hazard labels on the following equipment:
- 1. Each piece of service entrance equipment.
  - 2. Each power distribution switchboard or panel.
  - 3. Each individually mounted circuit breaker.
  - 4. Each branch circuit panelboard.
  - 5. Each motor control center.
  - 6. Each individually mounted motor starter.
  - 7. Each meter socket enclosure.
- P. Apply circuit/control/item designation labels of engraved plastic laminate for disconnect switches, breakers, pushbuttons, pilot lights, motor control centers, and similar items for power distribution and control components above, except panelboards and alarm/signal components, where labeling is specified elsewhere.
- Q. Install labels at locations indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.
- R. Engrave all receptacle plates other than those serving 120 volt, single phase devices. State voltage and amperage characteristics: Example; "208V 30A".

- S. Mark each device box (for each type of wiring device) with a permanent ink felt tip marker, indicating the circuit that the device is connected to: Example; "CKT A-1"
- T. Label circuit breaker feeding fire alarm panel "Fire Alarm Circuit". Using plastic laminate label, white lettering on a red background.

**END OF SECTION 26 0553**

## SECTION 26 0573

### PROTECTIVE DEVICE STUDY

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary conditions and Division 1 Specification sections, apply to work of this section.

##### 1.2 DESCRIPTION OF WORK:

- A. Studies in this section include the following:
  1. Fault current protective device and equipment evaluation
  2. Protective device coordination study
  3. Arc-flash hazard analysis and study

##### 1.3 QUALITY ASSURANCE:

- A. Provide protective device and arc-flash hazard studies performed by qualified engineers of the equipment manufacturer or an approved consultant. Studies must bear the professional engineer's stamp of the engineer in responsible charge of the protective device studies. Perform all work in accordance with latest IEEE and ANSI standards.

##### 1.4 SUBMITTALS:

- A. Refer to Section 260502 for electrical submittal requirements.

#### PART 2 – STUDIES

##### 2.1 FAULT CURRENT PROTECTIVE DEVICE & EQUIPMENT EVALUATION

- A. Perform fault current analysis with the aid of a computer and appropriate software. Include as input data the maximum available short circuit contribution, resistance and reactance components of the branch impedances, the X/R ratios, base quantities selected, and other source impedances.
- B. Coordination Criteria:
  1. All overcurrent protective devices serving the essential electrical system shall be coordinated for the period of time that a fault's duration extends beyond 0.1 second. Provide overcurrent protection devices with larger frames sizes to ensure coordination has been achieved.
  2. Coordination shall not be required as follows:
    - a. Between transformer primary and secondary overcurrent protective devices, where only one overcurrent protective device or set of overcurrent protective devices exist on the transformer secondary.
    - b. Between overcurrent protective devices of the same size (ampere rating) in series.
- C. Calculate fault current close and latch duty values and interrupting duty values on the basis of assumed three-phase bolted short circuits at each switchgear bus, medium



voltage controller, switchboard, low voltage motor control center, distribution panelboard, branch circuit panel and other significant locations throughout the system. Include symmetrical fault currents, and X/R ratios in the fault current tabulations. For each fault location, list the total duty on the bus, as well as the individual contribution from each connected branch, with its respective X/R ratio. Calculate ground fault currents at each bus. Incorporate major motor contributions in determining momentary and interrupting ratings of protection devices.

- D. Perform an evaluation to determine the adequacy of circuit breakers, molded case switches, automatic transfer switches, and fuses, by tabulating and comparing the short circuit ratings of these devices with the calculated fault currents. Apply appropriate multiplying factors based on system X/R ratios and protective device rating standards. Report problem areas or inadequacies in the equipment due to short circuit currents prior to release for fabrication of switchgear, switchboards and/or appliance panelboard.

## **2.2 PROTECTIVE DEVICE COORDINATION STUDY**

- A. Perform a protective device coordination study including the necessary calculations and logic decisions required to select power fuse ratings, protective relay characteristics and settings, ratios and characteristics of associated current transformers, and low voltage breaker trip characteristics and settings. Perform the studies in accordance with the latest applicable IEEE and ANSI standards.
- B. Include all medium and low voltage classes of equipment in the coordination study from the building or plant service protective devices down to and including the largest rated device in the low voltage motor control centers and panelboards. Include the phase and ground overcurrent protection as well as settings of all other adjustable protective devices.
- C. Develop time-current characteristics of the specified protective devices on log-log paper. Include complete titles, representative one-line diagram and legends, significant motor starting characteristics, complete parameters of transformers, complete operating bands of low voltage circuit breaker trip curves and fuses. Indicate on plots the types of protective devices selected, proposed relay taps, time dial and instantaneous trip settings, transformer magnetizing inrush and ANSI transformer withstand parameters, cable thermal overcurrent withstand limits and significant symmetrical and asymmetrical fault currents. Adhere to all restrictions of the National Electrical Code. Maintain proper coordination intervals and separation of characteristic curves.
- D. Provide coordination plots for phase and ground protective devices on a system basis. Provide a sufficient number of separate curves to clearly indicate the coordination achieved.
- E. Provide the selection and settings of the protective devices in a tabulated form listing circuit identification, IEEE device number, current transformer ratios and connection, manufacturer and type, range of adjustment and recommended settings. Provide a tabulation of the recommended power fuse selection for medium voltage fuses where applied in the system. Promptly report any discrepancies, problem areas, or inadequacies prior to release for fabrication of switchgear, switchboards and/or appliance panels.

## **2.3 ARC-FLASH HAZARD ANALYSIS AND STUDY**

- A. Perform an arc-flash hazard analysis and study. Include the necessary calculations required to determine the level of Personal Protection Equipment (PPE) that a worker must use, the Arc Flash Boundary in inches, and the incident energy at each location. This information shall be calculated and determined for each piece of service entrance equipment, each power distribution switchboard or panel, each separately-mounted circuit breaker, each motor control center, each individually mounted motor starter, and for each branch circuit panelboard.

- B. Perform the analysis and study in accordance with IEEE 1584.
- C. Furnish and install a label at each piece of service equipment, each power distribution switchboard or panel, each separately mounted circuit breaker, each motor control center, each individually mounted motor starter, and each branch circuit panel board. The label shall be an ANSI approved Arc Flash Warning Label that warns and instructs workers of the arc flash hazard, voltage, arc flash boundary, and required PPE (Personal Protective Equipment).

## **2.4 ANALYSIS/REPORT**

- A. Include the following in the report.
  - 1. Description, purpose, basis and scope of the study and a single line diagram of that portion of the power system that is included within the scope of the study.
  - 2. Tabulations of circuit breaker, fuse and other protective device ratings versus calculated short circuit duties and commentary regarding same. Include formulas and description of methods used.
  - 3. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.
  - 4. Fault current calculations including a definition of terms and guide for interpretation of computer printout.
  - 5. Recommended size for power fuses and recommended settings for ground fault relays and for all adjustable trip relays, circuit breakers, etc.
  - 6. Tabulation of arc-flash calculations for each location and tabulation of arc-flash hazard, voltage, boundary and required PPE for each equipment item listed in the arc-flash analysis.

## **2.5 PROTECTIVE DEVICE TESTING, CALIBRATION AND ADJUSTMENT**

- A. Provide adjustments to circuit breakers and switchboard AIC ratings as deemed necessary by the analysis/report, with no additional cost to the Owner. Provide over current protection devices with larger frame sizes to ensure coordination has been achieved.
- B. Provide the services of a qualified field engineer employed by the equipment manufacturer, and necessary tools and equipment to test, calibrate and adjust the protective relays, ground fault relays and circuit breaker trip devices as recommended in the Protective Device Study.

## **2.6 TYPEWRITTEN DEVICE SETTING TABULATION:**

- A. Provide type written tabulation that includes all settings for each protective relay, ground fault relay and circuit breaker solid-state trip devices. Enclose the table in a protective plastic sleeve and affix to the main service entrance equipment.

**END OF SECTION 26 0573**

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## SECTION 26 0923

### OCCUPANCY SENSORS

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-26 section making reference to wiring devices specified herein.

##### 1.2 DESCRIPTION OF WORK:

- A. The extent of occupancy sensor work is indicated by drawings and schedules.
- B. Types of occupancy sensors in this section include the following:
  - 1. Dual Technology Wall Switch
  - 2. Dual Technology Wall Switch with Dimming and Daylight Control.
  - 3. Dual Technology Ceiling Sensor w/ Control Pack

##### 1.3 QUALITY ASSURANCE:

- A. Comply with NEC and NEMA standards as applicable to construction and installation of occupancy sensors. Provide occupancy sensors that have been UL listed and labeled.
- B. All sensors shall be capable of operating normally with electronic ballasts, PL lamp systems, motor loads and any other passive infrared or microwave systems.

##### 1.4 SUBMITTALS:

- A. Refer to Section 26 0502 for electrical submittal requirements.

#### PART 2 - PRODUCTS

**2.1 MANUFACTURER:** The manufacturer shall have a minimum of five years of experience in the sensor and lighting control industry. Sensors and related relays shall be compatible with the specific lighting types controlled. All sensors shall be of the same manufacturer, mixing brands of sensors is not acceptable.

- A. **DUAL TECHNOLOGY WALL SWITCH:** Where units are indicated provide a sensor that meets the following minimum requirements:
  - 1. Sensor shall utilize PIR (Passive Infrared) to turn on the lights and then PIR or US (Ultrasonic) technologies to keep lights on.
  - 2. Sensor shall incorporate an inrush current limiter circuit to protect the relay contacts.
  - 3. Sensor shall utilize single or dual dry relay contacts for control of the lighting loads. Contractor shall verify requirements in coordination with the drawings.
  - 4. Sensor shall have a self-adjusting time delay, selectable 5, 15 and 30 minutes.
  - 5. Sensor shall have automatic sensitivity adjustment and be microprocessor controlled.
  - 6. Sensor shall have light level sensing 0 to 200 footcandles.

7. Sensor shall have a 180 degree field of view, coverage up to 800 square feet and shall detect 6 inches of hand movement towards the sensor up to 300 square feet; and body motion towards the sensor up to 1000 square feet.
  8. Sensor shall be rated for 0 to 800 watts at 120VAC and 0 to 1200 watts at 277VAC.
  9. Sensor shall be automatic on and shall have an automatic to off override switch on the unit. Switch shall be equipped with an air gap switch to disconnect power to the lighting load.
  10. Sensor shall have real time motion indicator on the front of the unit.
  11. Sensor shall mount to a single gang switch box.
  12. Subject to compliance with the above requirements. Provide models of one of the following:
    - a. Douglas
    - b. Greengate ONW-D
    - c. Wattstopper
- B. DUAL TECHNOLOGY WALL SWITCH WITH DIMMING AND DAY-LIGHT CONTROL:  
Where units are indicated, provide a sensor that meets the following minimum requirements:
1. Dual technology sensors shall have one of its two technologies, not require motion to detect occupancy.
  2. Sensors shall offer a minimum on timer of at least 15 minutes, in order to prevent all cycling of lamps before they have burned for the lamp manufacturers minimum recommended time period.
  3. Sensors shall utilize an occupancy time delay that keeps lights on after last detected occupancy. Factory default setting of the occupancy time delay shall be 15 minutes.
  4. Manual adjustment to the occupancy time delay so as to increase it shall be accommodated.
  5. Sensor shall be capable of switching both 120 VAC and 277 VAC.
  6. Sensor shall recess into single gang switch box and fit standard GFI opening.
  7. Sensor shall meet NEC grounding requirements by providing a dedicated ground connection and intrinsically grounding through its mounting strap.
  8. Line and load wire connections shall be interchangeable.
  9. Wall switch sensor shall have field programmable adjustments for selecting operational modes, occupancy time delays, minimum on time, and photocell set-point.
  10. Sensor shall be capable of both auto-on and manual operation.
  11. Combination photocell/dimming sensors set point and deadband shall be automatically calibrated through the sensors microprocessor by initiating the automatic set point programming procedure. Min and max dim settings as well as set point may be manually entered.

12. Subject to compliance with the above requirements, provide models of one of the following:
    - a. Douglas
    - b. Sensor-switch – N5X-PDT-D Series
    - c. Wattstopper – DW-311 (No Daylight Dimming, use when daylighting is not required)
- C. DUAL TECHNOLOGY CEILING SENSOR: Where units are indicated, provide a sensor that meets the following minimum requirements:
1. Sensor shall incorporate ultrasonic (microphonics) and infrared technologies in a single unit.
  2. Sensor shall be Class 2, low voltage; capable of mounting in the ceiling for maximum coverage.
  3. Sensor shall use internal microprocessor for motion signal analysis and automatic self-adjustment.
  4. Sensor shall have automatic self-adjustment algorithm that adjusts timer and sensitivity settings to maximize performance and minimize energy usage.
  5. Sensor shall have manual time-out adjustment from 8 minutes to 32 minutes and automatic time out from 8 minutes to 100 minutes.
  6. Sensor shall have test time-out setting of 8 seconds, with automatic return to 8 minutes after one hour if sensor is left in test mode.
  7. Sensor's microprocessor shall automatically extend timer by 1 hour in response to recognition to false off condition. After 5 hours, sensor reduces extended time by 30 minutes and continues to reduce by 30 minute increments over the next few days.
  8. Sensor's microprocessor shall automatically reduce either PIR or ultrasonic sensitivity in response to false on condition.
  9. Sensor microprocessor will automatically monitor PIR background threshold signal level and makes corresponding sensitivity adjustments automatically.
  10. Sensor microprocessor algorithm shall incorporate automatic adaptation to continuous airflow.
  11. For airflow that is so intense as to mask motion, sensor shall flash indicator LED code to indicate excessive airflow.
  12. Sensor's microprocessor shall use a four week learning period and develop a circadian calendar.
  13. An internal 24 hour 7 day clock establishes what periods the room is typically occupied, biasing sensor to keep lights on while normally occupied and off when normally unoccupied.
  14. Sensor shall have selection settings for the following dual technology schemes:
    - a. High Sensitivity and High Confidence (miser mode)
  15. Sensor shall be available with either 180 degrees or 360 degrees coverage pattern.
  16. Infrared lens shall have 360 degree field of view. Two types of lens shall be available, standard and extra dense.
  17. Sensor shall have a variety of mask inserts for PIR coverage rejection to prevent false tripping.
  18. Transducers shall be protected from tampering.

19. Sensor shall have manual adjustments for timer and sensitivities and override switches to force manual adjustment mode.
  20. Sensor shall have adjustable sensitivity from 0% to 100% for both ultrasonic and infrared.
  21. Controls shall be behind cover to resist tampering. All adjustments shall be accessible from the front of the sensor.
  22. Sensor shall be available with a photocell adjustment from 20 to 3,000 Lux.
  23. Sensor shall provide internal operating status and settings confirmation via LED motion lamp indicator.
  24. Sensor shall have two (if 180 degree) or three (if 360 degree) real time LED motion indicators visible from the front of the unit: Red = infrared; green = ultrasonic.
  25. Subject to compliance with the above requirements, provide models of one of the following:
    - a. Douglas
    - b. Hubbell-ATD Series
    - c. Sensor Switch-CM-PDT Series
    - d. Wattstopper-DT Series
    - e. Mytech-Omni-DT Series
    - f. Lithonia - LMTO Series
    - g. Leviton – OSC UOW Series
    - h. Greengate OMC – DT Series
- D. 24 VDC POWER/CONTROL PACK: Where units are indicated, provide a power/control pack that meets the following minimum requirements:
1. Control module shall consist of a DC power supply and a dry contact relay for switching a lighting load.
  2. Control module shall consist of a DC power supply and a dry contact relay for HVAC control.
  3. Control module shall be available in versions to accept 120, and 277 VAC line voltages.
  4. Output shall be 24VDC nominal, and shall be inherently safe, low voltage, limited power output (Class 2).
  5. Output shall supply 100mA current, in addition to current consumed internally to operate internal relay.
  6. Relay shall utilize normally open, silver alloy dry contacts, and shall be rated for a 20A ballast load at 120V and 277V.
  7. Relay function shall not require more than 5 mA control current to operate.
  8. Control module shall have line voltage wiring, consisting of input voltage and relay contact connections, exiting from one end, and low voltage DC connections, consisting of ground, power, and control wires, exiting from the other end.
  9. Control module shall be sized to fit inside a standard 4" x 4" junction box.
  10. Control module shall be equipped with a 1/2" EMT threaded male fitting on the line voltage end, such that it may be mounted to the outside of a junction box with the line voltage wiring internal to the box and the low voltage wiring external.
  11. Control module shall be equipable with accessory 1/2" EMT threaded male fitting on the low voltage end, such that it may be mounted to the inside of a ballast

cavity with the box and line voltage wiring internal to the cavity and the low voltage wiring external.

12. Slave module shall be available for switching additional circuits. Slave module has same construction and specifications as control module except without power supply function.
13. Subject to compliance with the above requirements, provide models of one of the following:
  - a. Douglas
  - b. Hubbell-CU Series
  - c. Sensor Switch-PP-20 Series
  - d. Wattstopper-BEP Series
  - e. Mytech-MP Series
  - f. Lithonia - LPCS Series
  - g. Greengate SP20-MV Series
  - h. Leviton – OSC/OSA Series

### **PART 3 – EXECUTION**

#### **3.1 INSTALLATION OF LIGHTING CONTROL EQUIPMENT:**

- A. Install occupancy lighting control system components and ancillary equipment as indicated, in accordance with equipment manufacturer's written instructions, and with recognized industry practices, to ensure that lighting control equipment complies with requirements.
- B. Comply with requirements of NEC, and applicable portions of NECA's "Standard of Installation" pertaining to general electrical installation practices.
- C. Coordinate with other electrical work, including raceways, and electrical boxes and fittings, as necessary to interface installation of lighting control equipment work with other work.
- D. Contractor shall be on site as required, to adjust lighting control units for proper operation.
- E. Mount the switchpack in a standard 4" junction box. Mount sensor to a standard 4" junction boxes. Refer to manufacturer supplied mounting instructions.
- F. All lighting programming shall meet the requirements of the IECC 2018 or current energy code applied to the project.

#### **3.2 FIELD QUALITY CONTROL:**

- A. Upon completion of installation and after circuitry has been energized, demonstrate capability and compliance of system with requirements.
- B. System start-up: Provide a factory authorized technician to verify the installation and test the system.
- C. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.
- D. Contractor shall visit the job site 3 months after the owner has taken occupancy and adjust any units not operating properly, otherwise remove and replace with new units.

#### **3.3 PRODUCT SUPPORT AND SERVICES:**

- A. System Start-Up: Provide a factory authorized technician to verify the installation, test



the system, and train the owner on proper operation and maintenance of the system. Before requesting start-up services, the installing contractor shall verify that:

1. The sensors have been fully installed in accordance with manufacturer's installation instructions.
  2. Low voltage wiring for overrides and sensors is completed.
  3. Accurate 'as-built' load schedules have been prepared.
  4. Proper notification of the impending start-up has been provided to the owner's representative.
  5. Programming of all switches, sensors, power packs, relays, etc. shall be completed by factory authorized technician, prior to final and training.
- B. Factory support: Factory telephone support shall be available at no cost to the owner during the warranty period. Factory assistance shall consist of assistance in solving programming or other application issues pertaining to the control equipment. The factory shall provide a toll free number for technical support.
- C. Functional Testing:
1. The owner shall hire a third party that will conduct and certify the functional testing.
  2. Lighting controls devices shall be tested to ensure that control hardware and software are calibrated, adjusted, programmed, and in proper working conditions in accordance with the construction documents, manufacturer's instructions and code requirements. The following shall be performed:
    - a. Certify that sensors have been located, aimed and calibrated per manufacturer recommendations.
    - b. Status indicator operates properly.
    - c. Fixtures that are controlled by auto-on controls turn on to permitted level.
    - d. Fixtures that are controlled by manual on controls operate when manually activated.
    - e. Fixtures do not turn on incorrectly due to HVAC or movement outside the controlled area.
    - f. Confirm that occupancy sensors turn off after space is vacated and do not turn on unless space is occupied.
    - g. Simulate unoccupied conditions and confirm that vacancy sensors only turn on manually and turn off after space is vacated.
  3. The party responsible for the functional testing shall provide documentation that the installed lighting controls meet or exceed all performance criteria and shall not be directly involved in the design or construction of the project.

### **3.4 WARRANTY:**

- A. Manufacturer shall provide a one (1) year limited warranty on lighting control system. A ten (10) year limited warranty shall be provided on the lighting control relays.

**3.5 RECORD DRAWINGS:**

- A. Refer to Section 26 0502 for electrical Record Drawings Requirements (Following Lighting Controls).

**3.6 MANUFACTURER AUTHORIZED PERSONNEL TRAINING:**

- A. Building Operating Personnel Training: Train Owner's building personnel in procedures for starting-up, testing and operating lighting control system equipment.

**END OF SECTION 26 0923**

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## SECTION 26 0943

### LIGHTING CONTROL EQUIPMENT

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26 Basic Materials and Methods sections apply to work specified in this section.

##### 1.2 DESCRIPTION OF WORK:

- A. Extent of lighting control equipment work is indicated by drawings and schedules, and is hereby defined to include, but not by way of limitation, lighting control panels, control stations and other user interface devices, wiring and ancillary equipment.
- B. Types of lighting control equipment specified in this section, includes the following:
  - 1. Low voltage relay control panels
  - 2. Occupancy sensors
  - 3. Daylight sensors
  - 4. Wallstations/Switches
  - 5. Lighting Load Controllers (Room Controllers)
  - 6. Emergency Lighting Control Units/Generator Transfer Devices
- C. Requirements are indicated elsewhere in these specifications for work including but not limited to raceways, electrical boxes and fittings required for installation of lighting control equipment, not work of this section.

##### 1.3 QUALITY ASSURANCE:

- A. Manufacturers: Firms regularly engaged in manufacture of lighting control equipment and ancillary equipment, of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years. To ensure a uniform installation and single responsibility, all switching and dimming equipment described herein shall be supplied by a single manufacturer.
- B. Installer: Qualified with at least 3 years of successful installation experience on projects with lighting control equipment installation work similar to that required for project.
- C. NEC Compliance: The control system shall comply with all applicable National Electrical Codes regarding electrical wiring standards.
- D. NEMA Compliance: The control system shall comply with all applicable portions of the NEMA Standard regarding the types of electrical equipment enclosure.
- E. Codes and Standards: Provide units that meet the requirements of IEEE Std. 2000.1.1999.
- F. Independent Testing Laboratory: Provide units that have been tested and listed under UL

916 energy management equipment.

- G. Component Pre-testing: All control equipment shall undergo strict inspection standards. The equipment shall be previously tested and burned-in at the factory prior to installation.

#### 1.4 SUBMITTALS:

- A. Refer to Section 26 0502 for electrical submittal requirements.

### PART 2 - PRODUCTS

#### 2.1 ACCEPTABLE MANUFACTURERS:

- A. Manufacturer: Subject to compliance with requirements, provide lighting control equipment of one of the following;
  1. GreenGate Controls
  2. Acuity nLight Controls
  3. Hubbell Building Automation
  4. Lutron Lighting Controls
  5. Leviton Lighting Controls
- B. The lighting controls as shown are based upon GreenGate lighting controls. Prior approval and commitment to being able to provide similar and equal system is required before bidding this project. Any system different from Cooper Controls that requires additional relays, etc. not shown on plans due to lack of separation of relays and dimming zones must be accounted for and provided in the bid and must function as similar to that which is required in final installation.

#### 2.2 SYSTEM DESCRIPTION:

- A. The lighting control system shall provide seamless control and monitoring of all lighting included in the scope of work regardless of whether it is relay switched or dimmed.
- B. The lighting control system shall consist of low voltage relay control panels with programmable switch inputs, the panel shall be microprocessor controlled with a touchscreen interface display. The touchscreen shall provide relay status information viewable through a protected windowed enclosure. All local programming shall be permissible through the self-prompting touchscreen.
- C. Programmable intelligence shall include:
  1. Time of day control (64 time-of-day/holiday schedules)
  2. 32 holiday dates
  3. Timed inputs (adjustable from 1 to 99 minutes)
  4. Timed override (from touchscreen, adjustable from 1 to 999 minutes, then resumes normal schedule)
  5. Pre-set controls
  6. Auto daylight savings adjust
  7. Low voltage Dimming/Central Dimming Controls:
    - a. 0-10V dimming capability
    - b. Daylighting control via 0-10V dimming relays and programming
    - c. DMX or other dimming protocols as indicated on plans

8. Astronomical clock with offsets
  9. Local control (from touchscreen and local switch)
  10. Digital wallstations/switches
  11. Flash warning of impending off for occupants
  12. Network override
- D. The controller shall permit lighting to be overridden on for after-hours use or cleaning. The controller shall provide priority and masking choices to allow for customizing the functions of switch inputs, thereby enabling wallstations/switches to function differently at different times of day. These overrides shall be digital, network or hard-wired inputs.
- E. The lighting control system shall be fully programmable through PC programming software. Programming shall be permitted through a direct RS-232 connection, modem or TCP/IP.
1. Shall include with user-friendly software suitable for operation on computer workstations which serve as central control stations for the selection and operation of lighting scenes.
  2. All software shall be programed by the vendor and delivered ready to use. This program shall include preparation of all graphics, and displays required as a part of this project.
- F. The control system shall provide networking between lighting control panels. The network shall support up to a maximum of 254 control panels. Panels shall permit data sharing for global controls. All inputs shall be transferable over the network to create any switching pattern.
- G. The lighting control system shall log all control events. Log reports shall be available through the integral touchscreen or enterprise software.
- H. All lighting programing shall meet the requirements of the IECC 2021 or current energy code applied to the project.

## 2.3 EQUIPMENT:

- A. Relay Panel
1. Enclosure: Shall be NEMA 1 rated, code gauge steel cabinet. Enclosure and contents shall be designed to operate in interior spaces with temperatures of 32°f - 104°f (0°-40°c) and 0-90% non-condensing humidity. Enclosure shall be available with optional recessed mounting hardware. See drawings for mounting requirements and refer to schedules on drawings for sizes.
  2. Interior: Interiors shall be sized to accept relays and will provide true on/off indication of relay status through LED's. The system shall employ all modular connectors to avoid repeat wiring in case of component failure. The system CPU board shall be mounted on quick release hinge pins. All connections for the dry contact inputs shall incorporate modular connectors.
  3. Power Supply: The control panel shall incorporate the use of a multi-tapped transformer. The panel shall not require specification of voltage for each control location. The voltage of 120 and 277 VAC shall be available with each control panel.
  4. Cover: Provide surface cover with captive screws in hinged, lockable configuration. A wiring schedule directory card shall be affixed to the covers back to allow identification of circuits/relays/load controlled. Schedules must be typed

and related to final room names and numbers (not bid document room names and numbers).

5. High Voltage Barrier: The controller shall provide the ability to provide for either voltage separation or emergency circuit separation.
6. Relays: The system shall utilize normally open control relays, that are rated to 20A at 120/277 VAC. The relays shall be mechanically latching, and shall permit individual override and LED configuration of relay status. The relays shall be rated for 10 million operations.
7. System Controller: The system controller shall consist of an integral touchscreen that provides access to the main programming features. The touchscreen shall permit the user to manually command any or all relays individually.
  - a. Provide master on/off control of a relay group while still allowing individual relays to be overridden by their local switch.
  - b. The control system shall permit up to 32 dry contact inputs for override purposes. Momentary 3 wire or 2 wire (toggle) inputs shall be supported. Any input shall be software linked to any number or relays.
  - c. The controller shall provide timers for each override. Each override timer shall be capable of 0-999 minutes. Software shall enable or disable overrides based on priorities, masks or time of day scheduling.
  - d. The controller shall accept either dry contact or analog ambient light sensors. The controller shall provide power for the sensor. Sensors shall provide for outdoor, indoor or skylight applications and issue a command to the controller once the threshold is reached.
  - e. Each control panel shall incorporate diagnostic aids for confirmation of proper operation. The control panel shall employ both a backlit touchscreen and LED's to indicate:
    - i. Power
    - ii. System OK
    - iii. Network communications
    - iv. System clock and date
    - v. Programming confirmation
    - vi. Control panel subnet network communications
8. Emergency Relay Panels: Shall work in accordance with all governing codes and compliances and all local codes having jurisdiction. Emergency Relay panels shall operate as normal powered relay panels during normal non-emergency power conditions. In case of emergency or power outage emergency designated panels shall work independently and provide automatic and maintained full on power, illumination and control functioning to all designated egress luminaires throughout the building and project site.
9. Wallstations/Switches/Plates: The lighting controller shall support digitally addressable LED annunciated switches. Provide low voltage push-button switches in up to 6 button configurations. Provide factory engraved labeling for individual push-buttons. Provide in color to match wiring devices and coverplate to match devices and plates in Wiring Devices (Section 26 2726).
10. Photocells:
  - a. Provide a photocontrol point that consists of an architecturally compatible sensor mounted in the appropriate location for measuring the available daylighting. Each sensor will have a separate calibration module mounted in an enclosure in the electrical closet.

- i. Exterior Lighting: Provide a hooded sensor that can be horizontally mounted on a ½" KO or threaded conduit. The unit shall employ a flat lens and work with a foot-candle range between 1-10 or 10-100 in 10% increments.
  - b. Control Unit shall allow for either direct control of up to three devices. These devices can be a relay, or any other device which allows control by a three wire momentary contact.
  - c. Control unit shall be switchable between four foot-candle measurement ranges (1- 10 FC, 10- 100 FC, 100- 1000 FC and 1000- 10,000 FC ). Depending upon the sensor head and application.
  - d. Control unit shall have separate trip points for the high and low response settings. These settings shall be entered via dial switches. LED's shall be provided to illustrate whether the sensor is below the 'low' setting, above the 'high' setting, or in the deadband range.
  - e. Control unit shall allow for a momentary contact device to override the photocell relays to either an on or off state.
  - f. Control unit shall employ a 3-minute time delay between switching outputs to avoid nuisance tripping. It shall be possible to disable the time delay to aid in initial setup and trouble shooting.
  - g. Sensor devices shall be available to match application. Each sensor shall employ photodiode technology to allow a linear response to daylight in its given foot-candle range:
- 11. Low Voltage Dimming (0-10V):
  - a. Capable of controlling any 0-10V source with the required dimming channels.
  - b. 0-10V analog voltage signal.
  - c. Provide isolated 0-10V output signal conforming to IEC 60929.
  - d. Sink current via IEC 60929.
  - e. Source current.
- 12. Indoor Lighting: Provide a sensor with a Fresnel lens providing for a 60° cone shape response area. The unit shall work with a range between 10-100 foot-candles.
- 13. Skylights: Provide a daylight sensor with a translucent dome with a 180° field of view and respond in the range of 1,000
- 14. Wallstations: Provide low voltage push-button type switches up to 8 button configurations to match requirements of lighting control within the room. Provide factory engraved labeling for individual push buttons. Provide in a color to match wiring devices and coverplates to match devices and plates in Wiring Devices (Section 26 2726). Wallstation shall connect to the room controller via the room controller local network. Wallstations that require user interface to allow for raise/lower control of dimming, loads shall include a slider function or similar. All wallstations shall have the ability to be independently program or be re-programmed on site and without the need to replace or send the device to the manufacturer for re-programming.
- 15. Wiring:



- a. Provide manufacturer approved 18/2 AWG solid cabling (Dataline) with a topology free, polarity free wiring arrangement to connect lighting control devices.
  - i. All dialog system cabling shall be white or gray.
- b. Provide Dataline cabling between centralized relay panel controller and other necessary building controllers via Dialog Network Dataline. The Dialog Network Dataline allows a maximum single wiring run of 1000ft and a total aggregated length of 3000ft from all datalines originating from an LCU located in the Master Panel CLCP. Provide standard School Network drop at the main CLCP for connection to the Global Web Server.
  - i. Classrooms to be independent and not connected to the centralized system.
- c. Programming: Provide a RS-232 (RJ-R Connection) to allow programming through either a local connection or remotely through a modem.
- d. Provide wiring in conduit located within the walls and non-accessible ceilings. Provide wiring above accessible ceilings in conduit to system enclosure to system enclosure.

**16. Systems Communicating & BACnet IP;**

- a. **Enterprise Software: Provide a PC based interface software that provide access to the lighting control system files within a Windows® environment. The software shall allow individual or network panel programming to be executed locally, via direct connection or remotely through a TCP/IP connection or modem.**
- b. **Ethernet Interface Module: Provide access to the control panels over a TCP/IP connection by converting sent information into RS-232 communication capable information.**
- c. **Automation Interface Module to district wide BMS: The control panel shall provide for data protocol translation and permit systems that utilize the Modbus® N2, BACnet or LonWorks communication protocols to operate individual relays or relay groups.**
- d. **Provide programming and training time to properly integrate into the Owner's BMS system. Program system per the owner's requirement. Train owner so as to allow them to have the ability to make changes to the system in the future.**

**B. Room Controllers:**

- 1. The room controller shall provide the following functionality;
  - a. Provide interface with room occupancy sensor to provide lighting and receptacle control and be programmable as either manual on/automatic off. Provide interface with room wallstations to provide multi-level switching and/or variable dimming. Provide interface with daylight sensors to provide daylighting controls of lighting fixture via multi-level (step dimming) and/or variable dimming.
- 2. The room controller shall be a fully functional lighting control system to match the room lighting and control requirements. The controller shall provide the following features:
  - a. Separate compartments for line voltage, emergency voltage and low voltage connections.
  - b. Breakouts for direct conduit connections.

- c. Dual voltage (120/277 VAC)
  - d. Low voltage connections using standard RJ-45 connectors.
  - e. Zero cross circuitry for each load.
  - f. Relay and 0-10V dimming zone configuration to match room requirements.
  - g. The ability to be independently program or be re-programmed on site and without the need to replace or send the device to the manufacturer for re-programming.
3. Emergency Lighting: When the room controller is provided with emergency relay, the controller shall be UL 924 Listed and monitor the normal power circuit. The UL 924 relay will track the normal power operation. Upon loss of normal power the emergency lighting will be forced on to full bright (if dimming) until normal power is restored. The following features shall be included:
- a. 120/277 VAC
  - b. Push-to-test
4. Daylight sensors shall work with the room controller to provide automatic daylight dimming capabilities for loads connected to the room controller. The daylight sensor shall include the following features:
- a. An additional photodiode that measures only the visible spectrum.
  - b. The sensor shall have three light level ranges;
    - i. Low (3-300 LUX), high (30-3000 LUX) and direct sun (300-30,000 LUX).
  - c. The sensor shall provide the capability of controlling multiple (up to three) daylight zones for dimming daylight harvesting.
  - d. The sensor shall include an internal photodiode that measures light in a 60 degree angle cutting off the unwanted light from the interior of the room.
5. Ceiling Mounted Occupancy Sensors: Sensors shall utilize dual-technology (ultrasonic and infrared technologies) and have the following additional features:
- a. Sensor shall be class 2, low voltage; capable of mounting in the ceiling for maximum coverage.
  - b. Sensor shall have automatic self-adjustment algorithm that adjusts timer and sensitivity settings to maximize performance and minimize energy usage.
  - c. Sensor shall have 360 degree field of view.
  - d. Sensor shall incorporate non-volatile memory such that all settings and parameters are saved in protected memory.
  - e. Sensor shall have time delays from 10 to 30 minutes.
  - f. Sensor shall provide a visual means of indication that motion is being detected via an LED.
  - g. Sensors shall have readily accessible, user adjustable settings for time delay and sensitivity.
  - h. Provide internal additional isolated relay with NO, NC and common outputs for use with HVAC control, data logging and other control options.
6. Wallstations: Provide low voltage push-button type switches up to 8 button configurations to match requirements of lighting control within the room. Provide factory engraved labeling for individual push buttons. Provide in a color to match wiring devices and coverplates to match devices and plates in Wiring Devices

(Section 26 2726). Wallstation shall connect to the room controller via the room controller local network. Wallstations that require user interface to allow for raise/lower control of dimming, loads shall include a slider function or similar. All wallstations shall have the ability to be independently program or be re-programmed on site and without the need to replace or send the device to the manufacturer for re-programming.

C. Emergency Power Control (CEPC)/ Emergency Lighting Control Units (ELCU)/Generator Transfer Devices (Required when not built into Room Controller, Relay Panel, etc):

1. The Emergency Power Control (CEPC)/Lighting Control Unit (ELCU) shall provide all required functionality to allow any standard lighting control device to control emergency lighting in conjunction with normal lighting in any area within a building. The unit shall be installed flush to the ceiling so that test switch & LED's are in plain view of room occupants as required by some local electrical codes.
2. The device shall automatically illuminate connected emergency loads upon utility power interruption, regardless of room switch position. (NEC 700.24)
3. Local room switch or lighting control shall turn both regular & emergency luminaires on at the same time (no dedicated emergency room switch required).
4. The emergency lighting control unit shall allow control of emergency lighting fixtures in tandem with normal lighting in an area while ensuring that emergency lighting will turn on immediately to full brightness upon loss of normal power supplying the control device. Emergency lighting operation shall be independent for each controlled area and shall not require a generalized power failure for proper operation.
5. The unit shall be compatible with 2-wire, 3-wire, 0-10V, & DALI dimming systems & ballasts.
6. The device shall be self-contained, measure 1.70" x 2.97" x 1.64," and provide integral one half inch pip nipple mount with snap in locking feature for mounting into a standard junction box KO.
7. The device shall have normally closed dry contacts capable of switching 20 amp emergency ballast loads @ 120-277 VAC, 60 Hz, or 10 amp tungsten loads @ 120 VAC, 60 Hz.
8. The device shall have universal rated voltage inputs provided for normal power sense and normal switched power at 120-277 VAC, 60 Hz.
9. The device shall have an integral momentary test switch. Pressing and holding this switch shall instantly force the unit into emergency mode and turn on emergency lighting. Releasing the test switch shall immediately return the unit to normal operation.
10. The unit shall provide dedicated leads and 24 VDC source for connection to remote test switch, fire alarm system, or other external system capable of providing a normally closed dry contact closure. Breaking contact between the terminals shall force and hold the emergency lighting on until the terminals are

again closed. An integral LED indicator shall indicate the unit's current remote activation status.

11. The device shall provide separate LEDs to indicate the presence of normal and emergency power sources. The LEDs shall indicate the unit's current operational mode (normal or emergency).
12. The device's normal power input lead shall be connected to the line side of the control device such that any upstream fault causing a loss of power, including the tripping of the branch circuit breaker, will force the unit into the emergency mode and turn on the emergency lighting.
13. The unit shall automatically switch emergency lighting on and off as normal lighting is switched. When normal power is not available, the unit shall force and hold emergency lighting on regardless of the state of any external control device until normal power is restored.
14. The unit shall utilize zero crossing circuitry to protect relay contacts from the damaging effects of inrush current generated by switching electronic ballast loads.
15. The unit shall have UL 94-V0 or UL 94-5VA flame rating & be approved for installation above the suspended ceiling.
16. To ensure quality and reliability, the unit shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%.
17. The device shall not generate any objectionable electrical or mechanical noise.
18. The unit shall be UL and cUL listed and labeled for connection to both normal and emergency lighting power sources.

D. Interface and Accessories (Classroom Solatubes Controller Interface):

1. Provide serial data interface that connects to the room controllers local network to a third-party system for coordinated control of devices including lighting controls, solatube controls and user interfaces by either system.
  - a. Provide manufacturer capable communication devices capable of communicating via standard protocols – RS-232, RS-485 and Ethernet (Preferred Method).
2. Program shades, per owner's requirements, to operate in accordance with the defined lighting presets within the space.

**PART 3 - EXECUTION:**

**3.1 INSTALLATION OF LIGHTING CONTROL EQUIPMENT:**

- A. Install lighting control system components and ancillary equipment as indicated, in accordance with equipment manufacturers written instructions, and with recognized

industry practices, to ensure that lighting control equipment complies with requirements.

- B. Comply with Requirements of NEC, and applicable portions of NECA's 'Standard of Installation' pertaining to general electrical installation practices.
- C. Coordinate with other electrical work, including raceways, electrical boxes and fittings, as necessary to interface installation of lighting control equipment work with other work.
- D. Electrical Identification: Refer to Section 26 0553 for requirements.

### **3.2 FIELD QUALITY CONTROL:**

- A. Upon completion of installation and after circuitry has been energized, demonstrate capability and compliance of system with requirements.
- B. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.

### **3.3 PRODUCT SUPPORT AND SERVICES:**

- A. System Start-Up: Provide a factory authorized technician to verify the installation, test the system, and train the owner on proper operation and maintenance of the system. Before requesting start-up services, the installing contractor shall verify that:
  - 1. The control system has been fully installed in accordance with manufacturer's installation instructions.
  - 2. Low voltage wiring for overrides and sensors is completed.
  - 3. Accurate 'as-built' load schedules have been prepared for each lighting control panel.
  - 4. Proper notification of the impending start-up has been provided to the owner's representative.
  - 5. Programming of all wallstations/switches, relays, groups of relays and interfaces with building automation shall be completed by factory authorized technician, prior to final and training.
- B. Factory support: Factory telephone support shall be available at no cost to the owner during the warranty period. Factory assistance shall consist of assistance in solving programming or other application issues pertaining to the control equipment. The factory shall provide a toll free number for technical support.

### **3.4 PROGRAMMING:**

- A. Program of all lighting control systems as directed by the electrical engineer and/or owner. Meet with the electrical engineer at their office prior to preparation of shop drawings to discuss specific programming and zoning requirements of system(s). Each networked or standalone system shall be programmed to revert back to its normal "ON" position one hour after selecting a scene or raising or lowering a lighting zone.
- B. All lighting programming shall meet the requirements of the IECC 2021 or current energy code applied to the project.
- C. Integrate lighting controls into classroom or room AV touch Screen and Shade Controller. Provide interface as required. Coordinate with AV integrator to integrate with Touch Panel and GUI within the room. Lighting shall provide multiple presets and slider control options.

1. Sensors can be used to trigger automated settings for shades and projector screens based on room occupancy, ambient light level, etc.
2. Program lighting and shades, per owner's requirements, to operate in accordance with the defined lighting presets within the space.

### **3.5 COMMISSIONING:**

- A. A lighting control system requires at least one site visit for proper commissioning. If multiple site visits are required, the first ensures that the contractor is trained to install the system correctly. On the second, the factory trained engineer will start up the system, ensure that it is operating according to specification, and perform initial programming. The third visit is for the purposes of refining the programming, and training the owner/end user on the system.
- B. Provide factory-certified field service engineer to ensure proper system installation and operation under following parameters:
  1. Certified by the equipment manufacturer on the system installed.
  2. Site visit activities:
    - a. Verify connection of power feeds and load circuits.
    - b. Verify connection of controls.
    - c. Verify system operation control by control, circuit by circuit.
    - d. Obtain sign-off on system functions.
    - e. Demonstrate system capabilities, operation and maintenance and educate Owner's representative on the foregoing.
  3. At least three site visits to accomplish the following tasks:
    - a. Prior to wiring:
      - i. Review and provide installer with instructions to correct any errors in the following areas:
        1. Low voltage wiring requirements
        2. Separation of high and low voltage wiring runs
        3. Wire labeling
        4. Load schedule information
        5. Switching cabinet locations and installation
        6. Physical locations and network addresses of controls
        7. Ethernet connectivity
        8. Computer-to-network connections

9. Load circuit wiring
10. Connections to other systems and equipment
11. Placement and adjustment of Occupancy Sensors
12. Placement and adjustment of Photocells

b. After system installation:

- i. Check and approve or provide correction instructions on the following:
  1. Connections of power feeds and load circuits
  2. Connections and locations of controls
  3. Connections of low voltage inputs
  4. Connections of the data network
- ii. Turn on system control processor and upload any pre-programmed system configuration
- iii. Verify cabinet address(es)
- iv. Upload pre-programmed system configuration and information to switching and/or dimming cabinets
- v. Check load currents and remove bypass jumpers
- vi. Verify that each system control is operating to specification
- vii. Verify that each system circuit is operational according to specification
- viii. Verify that manufacturers' interfacing equipment is operating to specification
- ix. Verify that any computers and software supplied by the manufacturer are performing to specifications
- x. Verify that any remote WAN (Wide Area Network) connections are operating properly
- xi. Have an owner's representative sign off on the above-listed system functions

c. Before project completion and hand-off:

- i. Demonstrate system capabilities and functions to owner's representative
- ii. Train owner's representative on the proper operation,

adjustment, and maintenance of the system.

- C. Notification: Upon completion of the installation, the contractor shall notify the manufacturer that the system is ready for formal checkout. Notification shall be given in writing a minimum of 21 days prior to the time factory-trained personnel are required on site. Each field installed RJ45 connection must be tested prior to system interconnection. A test report must be furnished to manufacturer prior to scheduling commissioning activity. Manufacturer shall have the option to waive formal turn-on.
- D. Turn-On: Upon completion of all line, load and interconnection wiring, and after all fixtures are installed and lamped, Manufacturer's Certified Technician shall completely check the installation prior to energizing the system. Each installed relay system shall be tested for proper ON/OFF operations, and proper LED illumination. Each installed control cabinet shall be tested verifying that each controlled load adjusts to the selected setting and that all switch LED's illuminate properly.
- E. Provide written commissioning report including space/room names and numbers indicating list of all lighting equipment and devices tested and verifying proper operation of the system. Report shall include corrections, programming information/file, warranties, and owner's representative sign off on the above-listed system functions.
- F. At the time of checkout and testing, the owner's representative shall be thoroughly instructed in the proper operation of the system.

### **3.6 RETRO-COMMISSIONING:**

- A. During the one year warranty period, provide retro-commissioning services at three month, six month, nine month, and one year marks. Provide at least 4 hours of commissioning service for each of the four retro-commissioning periods. This will include meeting with the Owner to receive feedback on the system and making changes to the system including programming, task tuning.

### **3.7 MAINTENANCE:**

- A. Enable the end user to order new equipment for system expansion, replacements, and spare parts.
- B. Make new replacement parts available for a minimum of ten years from the date of manufacture.
- C. Manufacturing shall provide telephone technical support by factory personnel 24 hours a day, 7 days a week. Project cost overruns and delays can occur without this service. Answering services can add to frustration and delay the resolution of any problems or issues. Manufacturers who do not offer factory-direct technical support on a 24/7 basis should not be acceptable on this project.
- D. Provide factory-direct technical support hotline 24 hours per day, 7 days per week.
- E. Offer renewable annual service contracts, to include parts, factory labor, and annual training visits. Make service contracts available up to ten years after date of system commissioning.

### **3.8 WARRANTY:**

- A. Manufacturer shall provide a one (1) year limited warranty on lighting control system. A ten (10) year limited warranty shall be provided on the lighting control relays.



**3.9 RECORD DRAWINGS:**

- A. Refer to Section 26 0502 for electrical O & M requirements.

**3.10 TRAINING:**

- A. Provide four (4) hours of recorded training in two 2 hour sessions on the operation and use of the lighting control equipment, at job site, at no cost to the Owner.
- B. Provide a USB Flash device to the owner containing the information specified below. The media shall include all information required to allow the Owner to change the schedules themselves. The media shall contain a minimum of following:
  - 1. CAD drawing files of 'as-built' lighting control components and point to point connections.
  - 2. General configuration programming.
  - 3. Job specific configuration programming to include schedule.
- C. Tutorial file on complete programming of lighting control system

END OF SECTION 26 0943

**SECTION 26 1010**

**ENERGY & POWER METERING SYSTEM**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS:**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26 Basic Materials and methods sections apply to work of this section except as otherwise indicated. See Section 26 2713 Service Entrance, Section 26 2413 Switchgear and Switchboards, and Section 26 2416 Panelboards.

**1.2 DESCRIPTION OF WORK:**

- A. Provide equipment to measure, monitor, acquire and store electrical metering data, and to communicate energy and power data to the building BAS/BMS (Building Automation System/Building Management System). Communication of data to the BAS/BMS system shall use the BACnet protocol.
- B. System shall include, but not be limited to, electronic primary meters and sub-meters, meter/monitor devices, current and voltage transformers as required, microprocessors, communications network, communications modules and network equipment, and all ancillary equipment to provide a complete and operating Energy and Power Metering System.
- C. System shall measure kWh energy use, kW power, power factor, frequency, voltage and current data, and shall store and communicate this data separately for the following individual load categories: Total HVAC System; Interior Lighting; Exterior Lighting; Plug Loads; Process Load; and Building Operations and Other Miscellaneous Loads.

**TABLE C405.12.2  
ENERGY USE CATEGORIES**

| <b>LOAD CATEGORY</b>                              | <b>DESCRIPTION OF ENERGY USE</b>  |
|---|---|
| Total HVAC system                                 | Heating, cooling and ventilation, including but not limited to fans, pumps, boilers, chillers and water heating. Energy used by 120-volt equipment, or by 208/120-volt equipment that is located in a building where the main service is 480/277-volt power, is permitted to be excluded from total HVAC system energy use. |
| Interior lighting                                 | Lighting systems located within the building.   |
| Exterior lighting                                 | Lighting systems located on the building site but not within the building.  |
| Plug loads  | Devices, appliances and equipment connected to convenience receptacle outlets.  |
| Process load                                      | Any single load that is not included in an HVAC, lighting or plug load category and that exceeds 5 percent of the peak connected load of the whole building, including but not limited to data centers, manufacturing equipment and commercial kitchens.  |
| Building operations and other miscellaneous loads | The remaining loads not included elsewhere in this table, including but not limited to vertical transportation systems, automatic doors, motorized shading systems, ornamental fountains, ornamental fireplaces, swimming pools, in-ground spas and snow-melt systems.  |

- D. System shall also comply with 2021 IECC C405.12 Energy Monitoring Measurement Requirements and Energy Monitoring Credit 406.10.
- E. System shall store all meter data for at least 36 months.

- F. **PRIMARY METERING:** Primary metering equipment shall be utility-grade equipment. Functions provided by the Energy and Power Metering System equipment and components in this section include the following:
1. Data acquisition, data storage and communication to the the building BAS/BMS system
  2. Overall building electrical energy use data in kWh stored and communicated to the BAS/BMS at 15-minute intervals
  3. Overall building electrical power demand data in kW stored and communicated to the BAS/BMS at 15-minute intervals
  4. Overall building electrical power factor data stored and communicated to the BAS/BMS at 15-minute intervals.
  5. Building voltage data stored and communicated to the BAS/BMS at 15-minute intervals
  6. Building current data in amperes stored and communicated to the BAS/BMS at 15-minute intervals
- G. **SUBMETERING:** Submetering equipment shall be revenue-grade equipment. Functions provided by the Energy and Power Metering System equipment and components in this section include the following:
1. **Total HVAC System** equipment electrical energy in kWh, power demand in kW, voltage and current data stored and communicated to the BAS/BMS at 15-minute intervals
  2. **Interior Lighting** energy in kWh, power demand in kW, voltage and current data stored and communicated to the BAS/BMS at 15-minute intervals
  3. **Exterior Lighting** energy in kWh, power demand in kW, voltage and current data stored and communicated to the BAS/BMS at 15-minute intervals
  4. **Plug Load** energy in kWh, power demand in kW, voltage and current data stored and communicated to the BAS/BMS at 15-minute intervals
  5. **Process Load** energy in kWh, power demand in kW, voltage and current data stored and communicated to the BAS/BMS at 15-minute intervals
  6. **Building Operations and Other Miscellaneous Loads** energy in kWh, power demand in kW, voltage and current data stored and communicated to the BAS/BMS at 15-minute intervals
- H. Any additional equipment and accessories required for a fully functional metering system to meet the intent of the specifications shall be provided whether or not specifically listed herein.

### 1.3 QUALITY ASSURANCE:

- A. Comply with NEC as applicable pertaining to construction and installation of electrical/electronic metering systems and equipment.
- B. Comply with applicable requirements of UL safety standards pertaining to electrical/electronic metering systems and equipment. Provide equipment that has been UL listed and labeled.
- C. All work shall be done by expert technicians qualified in the field with knowledge of metering systems and experience installing similar systems.
- D. The manufacturer's qualified technician shall calibrate, test and adjust the metering system and make all final connections to the metering equipment

**1.4 SUBMITTALS:** Refer to Section 26 0502 for requirements.

## **PART 2 – PRODUCTS**

### **2.1 ACCEPTABLE MANUFACTURERS:**

- A. The acceptable manufacturers listed below shall provide Energy and Power Metering System equipment and install the necessary equipment within their electrical switchboards and panelboards.
- B. Subject to compliance with requirements, provide products of one of the following:
  - 1. Leviton Manufacturing Co. Inc. (Basis of Design)
  - 2. Cutler-Hammer Products, Eaton Corp.
  - 3. General Electric Co.
  - 4. Siemens Energy & Automation, Inc.
  - 5. Square D Co.

### **2.2 EQUIPMENT AND COMPONENTS:**

- A. **GENERAL:** Energy and Power Metering system:
  - 1. Shall measure, meter, record and store electrical energy and power data.
  - 2. Shall automatically communicate electrical energy and power data.
  - 3. The system shall utilize multiple submeters and power monitor devices throughout the electrical distribution system, located in multiple switchboards and panelboards that serve lighting, plugloads, hvac equipment and laboratories. The system shall acquire and store energy and power data from the primary meter and from each of the submeters/power monitor devices over a network, with the result that the data shall be centralized in the Central Energy & Power Display/Processor. The Central Energy & Power Display/Process shall communicate the data to the BAS/BMS systems.
  - 4. All set-up parameters shall be stored in non-volatile memory and retained in the event of a control power failure.
- B. **PRIMARY METER** equipment shall be a utility-grade device, located within manufacturer's switchboard. Meter equipment monitor devices shall:
  - 1. be designed for use with current inputs from standard instrument current transformers.
  - 2. shall measure line-to-line voltage each phase, line-to-neutral voltage each phase, line current each phase, frequency, power in kW of each phase (and total), apparent power each phase (and total).
  - 3. shall calculate line-to-line average 3-phase voltage, average current, total power demand in kW, power factor, and accumulated energy in kWh.
- C. **SUBMETER** equipment shall be revenue-grade devices, located within manufacturer's switchboards and panelboards. Meter equipment monitor devices shall:
  - 1. be designed for use with integral current sensors or external current transformers
  - 2. shall measure line-to-line voltage each phase, line-to-neutral voltage each phase, line current each phase, frequency, power in kW of each phase (and total), apparent power each phase (and total).
  - 3. shall calculate line-to-line average 3-phase voltage, average current, total power demand in kW and accumulated energy in kWh.

- D. POWER MONITOR DEVICES:
1. similar to Leviton "Leviton VerifEye Metering System"
  2. integral built-in current transformers up to 400 amperes
  3. monitors watts, watt-hours, watt demand, currents, voltages, frequency, reactive power, apparent power factor and displacement power factor
- E. CURRENT TRANSFORMERS:
1. Solid-core transformers, with ratings corresponding to the feeder breaker current rating.
  2. plus or minus 2% accuracy
  3. UL listed
- F. CENTRAL ENERGY & POWER DISPLAY/PROCESSOR:
1. Microprocessor-based.
  2. Shall acquire and store energy and power data from primary meter, submeters and power monitor devices.
  3. Shall communicate data to the BAS/BMS. Shall report data at 15-minute intervals as specified and described in paragraphs 1.2.F and 1.2.G.
  4. Shall store all metering data for at least 36 months.
  5. Shall report hourly, daily, monthly and annual energy use for each primary meter, submeter and power monitor device to comply with 2021 IECC 405.12/406 Energy Metering requirements.
- G. COMMUNICATION COMPONENTS AND NETWORKS:
1. Provide communications and control network, network hardware, software to effect acquisition of energy and power data between the Central Energy & Power/Display Processor and primary meter, submeters and power monitor devices. Include all interconnection connectivity, active equipment, communication interfaces, wires and cables as required.
  2. Provide communications modules, hardware, interface cards, etc. and software to communicate between the Central Energy & Power Display Processor and the building BAS/BMS system.
- H. CABLE SYSTEMS:
1. RS-485 Cable: PVC jacketed, paired, 2 pairs, twisted, No. 22 gauge minimum, stranded.
  2. Unshielded Twisted Pair - Category 6 minimum, as specified in Telecom cabling section.
  3. Other cables: as recommended by Energy & Power Metering system manufacturer.
  4. Certified for use at data speeds up to at least 100 Mbps.
- I. FACTORY REQUIREMENTS:
1. Energy and Power meters, submeters, power monitoring devices and ancillary components shall be factory-installed, wired and tested prior to shipment to the jobsite.
  2. All control power, CT, PT and data communications wire shall be factory-wired, harnessed and terminated within the switchboards, panelboards and equipment enclosures.
  3. Where external connections are required, terminal blocks shall be provided and the manufacturer's drawings shall clearly identify the interconnection

requirements for external wiring, including wire type to be used.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION OF ENERGY AND POWER METERING SYSTEM:**

- A. Install equipment and components in accordance with manufacturer's written instructions with recognized industry practices to ensure that installation complies with requirements of NEMA and NEC standards, and applicable portions of NECA's "Standard of Installation".
- B. Energy and Power monitoring components shall be factory installed, wired and tested prior to shipment to the jobsite.
- C. Network hardware shall be installed in accordance with the manufacturer's instructions.
- D. Software (as applicable) shall be designed specifically for energy, power monitoring and control. The software shall be a standard product offering with no customization required. The software shall be configured by the manufacturer's qualified technician.
- E. Electrical Identification: As required by the manufacturer, and as specified in Section 260553 Electrical Identification for requirements.

#### **3.2 WIRING:**

- A. All wiring external to metering equipment, switchboards and panelboards shall be installed in metallic conduit and provided with necessary junction and pull boxes. The electrical contractor shall provide all wiring and conduit, boxes, and rough-in. Wiring types and characteristics shall comply with equipment manufacturer recommendations. Care shall be exercised in wiring installation to avoid damage to the cables. Cables shall be pulled continuous without splicing, leaving ends in lengths as directed by the manufacturer's qualified technician.
- B. After all wiring, circuits and cables have been pulled and completed from one extremity to the other, the electrical contractor shall check all wiring free of opens, shorts and grounds.
- C. Provide equipment grounding connections, sufficiently tight to assure permanent and effective ground.
- D. The manufacturer's qualified technician shall calibrate, test and adjust the metering system and make all final connections to the metering equipment.

#### **3.3 FIELD QUALITY CONTROL:**

- A. Prior to system energization, check all power and control wiring for electrical continuity and communications wiring for signal integrity.
- B. EQUIPMENT CHECK-OUT: Provide equipment check-out by manufacturer's trained and authorized technician.
- C. TESTNG: Upon completion of installation of system, demonstrate system operation, capability and compliance with requirements. Where possible, correct malfunctioning equipment at site, then retest to demonstrate compliance. Otherwise, remove and replace with new equipment, and proceed with retesting.
- D. Subsequent to wire and cable connections, energize electrical system and demonstrate functioning in accordance with requirements.

#### **3.4 TRAINING:**

- A. Provide a minimum of four hours of in-service training with owner personnel.

**END OF SECTION 26 1010**

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## SECTION 26 2200

### TRANSFORMERS

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26 Basic Materials and Methods sections apply to work specified in this section.

##### 1.2 DESCRIPTION OF WORK:

- A. Extent of transformer work is indicated by drawings and schedules. Work includes complete installation and electrical connections.
- B. Types of transformers in this section include the following:
  - 1. Dry-type Distribution Transformers

##### 1.3 QUALITY ASSURANCE:

- A. Comply with NEC as applicable to installation and construction of electrical power/distribution transformers; with applicable portions of NEMA Std. Pub. Nos. TR1 and TR27; and with applicable ANSI/IEEE standards pertaining to power/distribution transformers.
- B. Comply with applicable portions of ANSI/UL 506; "Safety Standard for Specialty Transformers". Provide distribution transformers that have been UL listed and labeled.
- C. All characteristics, definitions, and terminology, except as specifically covered in this specification, shall be in accordance with the latest revision of the following ANSI/IEEE, NEMA, and Department of Energy standards.
  - 1. C57.12.00 – IEEE Standard for Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers.
  - 2. C57.12.28 – Pad-Mounted Equipment - Enclosure Integrity.
  - 3. C57.12.34 – IEEE Standard Requirements for Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers (2500 kVA and Smaller) - High Voltage: 34500GrdY/19920 Volts and Below; Low-Voltage: 480 Volt 2500 kVA and Smaller (issued in March 2005 - combines C57.12.22 and C57.12.26).
  - 4. C57.12.90 – IEEE Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers and IEEE Guide for Short-Circuit Testing of Distribution and Power Transformers.
  - 5. C57.12.91 – Guide for Loading Mineral-Oil-Immersed Transformers.
  - 6. NEMA TR 1-1993 (R2000) – Transformers, Regulators and Reactors, Table 0-2 Audible Sound Levels for Liquid-Immersed Power Transformers.
  - 7. NEMA 260-1996 (2004) – Safety Labels for Pad-Mounted Switchgear and Transformers Sited in Public Areas.
  - 8. 10 CFR Part 431 – Department of Energy – Energy Conservation Program for Commercial Equipment: Distribution Transformers Energy Conservation Standards; Final Rule.



9. NEMA ST-20 - Dry-Type Transformers for General Applications
10. NEMA TP-1-2002 – Standards for transformer energy efficiency.

**1.4 SUBMITTALS:**

- A. Refer to Section 260502 for electrical submittal requirements.

**PART 2 - PRODUCTS**

**2.1 DRY -TYPE DISTRIBUTION TRANSFORMERS:**

- A. GENERAL: Except as otherwise indicated, provide manufacturer's standard materials and components as indicated by published product information, designed and constructed as recommended by manufacturer, and as required for complete installation.
- B. MANUFACTURER: Subject to compliance with requirements, provide products of one of the following (for each type of transformer):
  1. Acme Transformer Company
  2. GE/ABB
  3. Cutler Hammer Products, Eaton Corp.
  4. Federal Pacific
  5. Hevi-Duty Electric Div., General Signal Corp.
  6. Jefferson Electric
  7. Schneider Electric/Square D Co.
  8. Hammond Power Solutions
  9. Siemens Energy & Automation, Inc.
- C. DRY-TYPE DISTRIBUTION TRANSFORMERS (GENERAL PURPOSE):
  1. Provide factory-assembled, general-purpose, air-cooled, aluminum wound dry-type distribution transformers where shown; of sizes, characteristics, and rated capacities indicated. Provide primary winding with minimum of 4 full capacity taps; each 2-1/2 percent, two above and two below full-rated voltage for de-energized tap-changing operation.
  2. Insulate with 220 degree C. UL recognized insulation system for 150° degree C rise above 40o ambient at full load.
  3. Limit sound levels to the following (as determined by ANSI/NEMA standards):
    - a. 30-50 KVA 45 dB
    - b. 51-150 KVA 50 dB
    - c. 151-300 KVA 55 dB
    - d. 301-500 KVA 60 dB
    - e. 501-1000 KVA 64 dB
  4. Provide terminal enclosure, with cover, to accommodate primary and secondary coil wiring connections. Equip terminal leads with connectors installed, suitable for copper or aluminum wiring. Cushion-mount transformer with vibration isolation supports. Provide transformers with ventilated, heavy gauge sheet steel enclosures. Apply manufacturer's standard light gray indoor enamel over cleaned and phosphatized steel enclosure. Provide transformers suitable for wall and floor mounting as indicated.

5. The percent impedance voltage, as measured on the rated voltage connection, shall be per Table 2.

| Table 2<br>Percent Impedance Voltage (Dry-Type) |              |
|---|--------------|
| KVA Rating (Secondary Voltage < 700 V)          | Impedance    |
| 0 - 75  | 3.00 – 5.75% |
| 112.5 - 225                                     | 4.00 - 5.75% |
| 300 and above                                   | 5.00 - 5.75% |

D. DRY-TYPE DISTRIBUTION TRANSFORMERS (K-RATED):

1. Provide factory-assembled, air-cooled, copper wound dry-type distribution transformers where shown; of sizes, characteristics, and capacities indicated, and UL listed for non-sinusoidal current loads of K-factor 13 (shown on drawings). See ANSI/IEEE C57.110-1986 for K-factor and UL Std 1561. Provide primary windings with a minimum of 4 full capacity taps; each 2-1/2 percent, two above and two below full-rated voltage for de-energized tap changing operator.
2. Insulate with 220 degree C UL recognized insulation system for 150° degree C rise above 40oC ambient at full load.
3. Include an electrostatic shield for attenuation of spikes, line noise, and transients. Wind coils with foil wrap to minimize effects caused by harmonic currents above the fundamental frequency. Provide transformer with neutral conductor and lugs sized at two times rated phase current.
4. Limit sound levels to the following:
  - a. 30-50 KVA 45 dB
  - b. 51-150 KVA 50 dB
  - c. 151-300 KVA 55 dB
  - d. 301-500 KVA 60 dB
  - e. 501-1000 KVA 64 dB
5. Provide terminal enclosure, with cover, to accommodate primary and secondary coil wiring connections. Equip terminal leads with connectors installed, suitable for copper or aluminum wiring. Cushion-mount transformer with vibration isolation supports. Provide transformers with ventilated, heavy gauge sheet steel enclosures. Apply manufacturer's standard light gray indoor enamel over cleaned and phosphatized steel enclosure. Provide transformers suitable for wall and floor mounting as indicated.
6. The percent impedance voltage, as measured on the rated voltage connection, shall be per Table 3.

| Table 3<br>Percent Impedance Voltage (Dry-Type, K-rated) |              |
|--|--------------|
| KVA Rating (Secondary Voltage < 700 V)                   | Impedance    |
| 0 - 75   | 3.00 – 5.75% |
| 112.5 - 225  | 4.00 - 5.75% |
| 300 and above  | 5.00 - 5.75% |

## PART 2 – EXECUTION

### 2.1 INSTALLATION OF TRANSFORMERS

- A. Install transformers as indicated, complying with manufacturer's written instructions,

applicable requirements of NEC, NEMA and IEEE standards, and in accordance with recognized industry practices to ensure that products fulfill requirements.

- B. Coordinate transformer installation work with electrical raceway and wire/cable work, as necessary for proper interface.
- C. Connect transformer units to electrical wiring system; comply with requirements of other Division-26 sections.
- D. MOUNTING: Provide concrete pad under all floor mounted equipment and equipment mounted at grade. Anchor transformer to pad with 3/8" expansion anchors at each corner of enclosure. Provide vertical and lateral support systems for all transformers that are supported from overhead structure. See drawings for support and attachment details. Provide neoprene vibration isolators at each anchor point.
- E. GROUNDING: Provide tightly fastened equipment grounding and bonding connections for transformers.
- F. TESTING: Upon completion of installation of transformers, energize primary circuit at rated voltage and frequency from normal power source and test transformers, including, but not limited to, audible sound levels, to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at the site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

**END OF SECTION 26 2200**

## SECTION 26 2413

### SWITCHGEAR AND SWITCHBOARDS

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26 Basic Materials and methods sections apply to work of this section except as otherwise indicated. See Section 262713 Service Entrance, for metering requirements. See Section 264313 for SPD requirements.

##### 1.2 DESCRIPTION OF WORK:

- A. Extent of switchgear and switchboards is indicated by drawings and schedules.
- B. Types of switchgear and switchboards in this section include the following:
  - 1. AC Dead Front Switchboards (600V)

##### 1.3 QUALITY ASSURANCE:

- A. Comply with NEC as applicable to construction and installation of electrical switchgear and switchboards. Provide switchgear and switchboards that have been UL listed and labeled.

##### 1.4 SUBMITTALS:

- A. Refer to Section 26 0502 for electrical submittal requirements.

#### PART 2 – PRODUCTS

##### 2.1 ACCEPTABLE MANUFACTURERS:

- A. Subject to compliance with requirements, provide products of one of the following (for each type of switchgear and switchboard):
- B. AC DEAD FRONT SWITCHBOARDS (600V):
  - 1. Square D Co. (Basis of Design)
  - 2. Cutler-Hammer Products, Eaton Corp.
  - 3. GE/ABB
  - 4. Siemens Energy & Automation, Inc.

##### 2.2 EQUIPMENT SECTIONS AND COMPONENTS:

- A. GENERAL: Except as otherwise indicated, provide switchgear and switchboards of types, sizes, characteristics, and ratings indicated, that comply with manufacturer's standard design, materials, components, and construction in accordance with published product information, and as required for a complete installation. See drawings and Section 262815. Series rated systems are not accepted.
- B. Overcurrent Protection Devices, for main and branch devices. Provide switchgear, switchboards, and overcurrent devices of one manufacturer.
- C. Provide each service entrance switchboard with surge protective device (SPD) mounted

in a separate enclosure adjacent to the switchboard/switchgear. See Section 264313 for SPD unit requirements. Provide in-line fusing for each phase of the device, and wire in accordance with manufacturer's instructions, with conductor length not exceeding 18".

### **2.3 AC DEAD-FRONT SWITCHBOARDS (600V):**

- A. Provide factory assembled, dead front, metal enclosed, floor standing, self supporting, group mounted, secondary power switch boards, of sizes, electrical ratings and characteristics indicated consisting of panel (vertical) units, and containing circuit breaker and fusible switch assemblies of quantities, ratings and types indicated. Provide aluminum main bus and connections to switching devices of sufficient capacity to limit rated continuous current operating temperature rise to UL standard; with main bus and tap connections silver-surfaced or tin-plated and tightly bolted for maximum interrupting capacity. Provide accessibility of line and load terminations from front of switchboard. Prime and paint switchboard with manufacturer's standard finish and color. Equip units with built-in lifting eyes and yokes; provide individual panel (vertical) units, suitable for bolting together at project site, and constructed for the following environment:
  - 1. Installation: Indoors, NEMA Type 1.
- B. Limit height of upper most overcurrent device handle to 6'-2" to accommodate 4" curb.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION OF SWITCHGEAR AND SWITCHBOARDS:**

- A. Install switchgear and switchboards where shown, in accordance with manufacturer's written instructions with recognized industry practices to ensure that switchgear and switchboards comply with requirements of NEMA and NEC standards, and applicable portions of NECA's "Standard of Installation".
- B. Install all switchgear and switchboards on 4" high concrete curb and bolt equipment to curb with 5/8" anchors at each corner and at intervals not to exceed 4 feet along perimeter. Install concrete wiring trench under switchgear and switchboards; 18" deep, and 4" smaller in length and width than equipment base. Install grounding bushings on conduits penetrating trench.
- C. Arrange conductors within switchgear and switchboards in neat fashion, and secure with suitable ties.
- D. Tighten fuses, if any, in each switchgear and switchboard.
- E. Provide and install spare fuse cabinet in main electrical room.
- F. Electrical Identification: Refer to Section 260553 for requirements.
- G. Provide a surge protective device on each switchboard located on the emergency distribution system. Refer to Section 26 4313 for requirements.

### **3.2 ADJUST AND CLEAN:**

- A. Adjust operating mechanisms for free mechanical movement.
- B. Touch-up scratched or marred surfaces to match original finish.

### **3.3 FIELD QUALITY CONTROL:**

- A. Prior to energization of switchgear and switchboards, check with ground resistance tester phase to phase and phase to ground insulation resistance levels to ensure requirements are fulfilled.
- B. Prior to energization, check switchgear and switchboards for electrical continuity of

circuits, and for short circuits.

- C. Subsequent to wire and cable connections, energize switchgear and switchboard and demonstrate functioning in accordance with requirements.

**END OF SECTION 26 2413**

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## SECTION 26 2416

### PANELBOARDS

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-26 section making reference to panelboards specified herein.

##### 1.2 DESCRIPTION OF WORK:

- A. The extent of panelboard and enclosure work, is indicated by drawings and schedules.
- B. Types of panelboards and enclosures in this section include lighting and appliance panelboards, and power distribution panelboards.

##### 1.3 QUALITY ASSURANCE:

- A. Provide units that have been UL listed and labeled. Comply with NEC as applicable to installation of panelboards, cabinets, and cutout boxes. Comply with NEC pertaining to installation of wiring and equipment in hazardous locations. Comply with NEMA Stds. Pub No. 250, "Enclosures for Electrical Equipment (1000 volt maximum). Pub No. 1, "Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less".

##### 1.4 SUBMITTALS:

- A. Refer to Section 260502 for electrical submittal requirements.

#### PART 2 – PRODUCTS

##### 2.1 ACCEPTABLE MANUFACTURERS:

- A. Subject to compliance with requirements, provide of one of the following:
  - 1. Square D Company (Basis of Design)
  - 2. Cutler Hammer Products, Eaton Corp.
  - 3. GE/ABB
  - 4. Siemens Energy & Automation, Inc.

##### 2.2 PANELBOARDS:

###### A. GENERAL:

- 1. Except as otherwise indicated, provide panelboards, enclosures and ancillary components, of types, sizes, and ratings indicated. Equip with number of unit panelboard devices as required for complete installation. Fully equip "spaces" with hardware to receive breaker or switch of size indicated. Provide CU/AL rated lugs of proper size to accommodate conductors specified.

###### B. POWER DISTRIBUTION PANELBOARDS:

- 1. Provide dead-front safety type power distribution panelboards as indicated, with switching and protective devices in quantities, ratings, types and with arrangement shown. Equip with aluminum bus bars, full-sized neutral bus and



ground bus. Provide fusible or circuit breaker branch and main devices as indicated. Series rated systems are not acceptable. See Section 262815, Overcurrent Protection Devices.

**C. LIGHTING AND APPLIANCE PANELBOARDS:**

1. Provide dead-front safety type lighting and appliance panelboards as indicated, with switching and protective devices in quantities, ratings, types, and arrangement shown. Provide bolt-on thermal magnetic type branch breakers. Where multiple breakers are indicated, provide with common trip handle. Series rated systems are not acceptable. Equip with aluminum bus bars, full-sized neutral bus, and ground bus.

**D. PANELBOARD ENCLOSURES:**

1. Provide galvanized sheet steel cabinet type enclosures, in sizes and NEMA types as indicated, code-gage minimum 16-gage thickness. Provide door-in-door hinged fronts. Provide fronts with adjustable indicating trim clamps, and doors with flush locks and keys, all panelboard enclosures keyed alike, with concealed door hinges and door swings as indicated. Equip with interior circuit-directory frame, and card with clear plastic covering. Provide baked gray enamel finish over a rust inhibitor. Provide enclosures fabricated by same manufacturer as overcurrent devices contained therein Bolt engraved plastic laminate labels indicating panel name and voltage on the interior and exterior of panelboards.
2. Provide floor to ceiling panel extensions for all surface mounted panels located outside of mechanical and electrical rooms.

**E. FINISH:**

1. Coat interior and exterior of surface with manufacturer's standard color; baked on enamel finish.

**F. ELECTRICAL IDENTIFICATION:**

1. Refer to Section 260553 for requirements.

**PART 3 – EXECUTION**

**3.1 INSTALLATION OF PANELBOARDS:**

**A. GENERAL:**

1. Install panelboards and enclosures where indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", in compliance with recognized industry practices to ensure products fulfill requirements.
2. Provide a surge protective device on each panelboard located on the emergency distribution system. Refer to section 26 4313 for requirements.

**B. MOUNTING:**

1. Provide 4" high concrete curb under floor standing distribution panelboards.
2. Coordinate installation of panelboards and enclosures with cable and raceway installation work. Anchor enclosures firmly to walls and structural surfaces, ensuring they are permanently and mechanically secure. Arrange conductors neatly within enclosure, and secure with suitable nylon ties. Fill out panelboard's circuit directory card upon completion of installation work. Utilize actual final building room numbers, not architectural numbers used on drawings. Identify individual lighting circuits and individual receptacle circuits by room served. Label circuit breakers to identify location of subpanel or equipment supplied using room numbers and equipment names. Include room number with equipment circuit designations. All directories to be typewritten.

**END OF SECTION 26 2416**

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**SECTION 26 2713**  
**SERVICE ENTRANCE**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS:**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26 Basic Materials and Methods sections apply to work specified in this section.

**1.2 DESCRIPTION OF WORK:**

- A. Extent of service-entrance work is indicated by drawings and schedules.
- B. Switchboards, panels, disconnects, transformers, etc., used for service-entrance equipment are specified in applicable Division-26 sections, and are included as work of this section.
- C. Consult local utility relative to all costs for line extensions, connections, etc., and include all costs for bringing service to the facility in base bid. Confirm location of point of service before bidding.
- D. Provide labor and materials as required to accomplish power company metering in accordance with power company standards and requirements.
- E. Provide concrete pads of size and type required for service transformers. Verify location, size, openings, reinforcing requirements with Rocky Mountain Power (RMP/Local Utility) before beginning work. Comply with RMP clearance requirements.

**1.3 QUALITY ASSURANCE:**

- A. Comply with NEC and NEMA standards as applicable to construction and installation of service-entrance equipment and accessories. Provide service-entrance equipment and accessories that are UL-listed and labeled, and equipment marked, "Suitable for use as Service Equipment".
- B. Provide and locate properly sized concrete padsvaults for power company furnished pad/vault mounted transformers in accordance with power company clearance requirements.

**1.4 SUBMITTALS:**

- A. Refer to Section 260502 for electrical submittal requirements.

**PART 2 – PRODUCTS**

**2.1 SERVICE - ENTRANCE EQUIPMENT:**

- A. GENERAL: Provide service-entrance equipment and accessories, of types, sizes, ratings and electrical characteristics indicated, that comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installation, and as herein specified.
- B. Provide each service entrance switchboard with Surge Protective Devices as required by Section 264313.

**2.2 OVERCURRENT PROTECTIVE DEVICES:**

- A. GENERAL: Provide overcurrent protective devices complying with Division-26 section "Overcurrent Protective Devices", and as indicated on drawings.

**2.3 METERING:**

- A. METER SOCKETS: Provide meter sockets that comply with requirements of local utility company supplying electrical power to service-entrance equipment of building project.
- B. METERS: Provide meters, current and potential transformers, selector switches, wiring, etc. for a complete metering system. Provide meter of same manufacturer as switchboard (equal to Square D Power Logic Circuit Monitor, Class 3020, Model CM-3250), integrally mounted in service equipment, completely wired with control power input. Provide capability for metering the following data:

| <u>INSTANTANEOUS READINGS</u> | <u>DEMAND READINGS</u>         |
|-------------------------------|--------------------------------|
| <u>RMS Current Values</u>     | <u>Current Values</u>          |
| Phase A Current               | Average Demand Current Phase A |
| Phase B Current               | Average Demand Current Phase B |
| Phase C Current               | Average Demand current Phase C |
| 3-Phase Average Current       | Peak Demand Current Phase A    |
| Apparent RMS Current          | Peak Demand Current Phase B    |
| RMS Voltage Values            | Peak Demand Current Phase C    |
| Phase A-B Voltage             | Real Power Values              |
| Phase B-C Voltage             | Average Demand Real Power      |
| Phase C-A Voltage             | Predicted Demand Real Power    |
| Phase A-N Voltage             | Peak Demand Real Power         |
| Phase B-N Voltage             | Phase C-N Voltage              |
| <u>Power Factor Values</u>    | <u>Energy Readings</u>         |
| Phase A Power Factor          | -                              |
| Phase B Power Factor          | Energy Accumulated             |
| Phase C Power Factor          | Reactive Energy Accumulated    |
| 3-Phase Total Power Factor    | -                              |
| 3-Phase Total Power Values    | -                              |
| Real Power, 3-Phase Total     | -                              |
| Reactive Power, 3-Phase Total | -                              |
| Apparent Power, 3-Phase Total | -                              |
| Frequency                     | -                              |
| Temperature                   | -                              |

- C. Provide with integral display, selection keys, and indicating LEDs. For each instantaneous reading, provide a running maximum and minimum history in non-volatile memory, capable of externally operated reset. Provide "waveform capture" feature to allow subsequent analysis of actual current and voltage profile for harmonic distortion.

## **2.4 RACEWAYS AND CONDUCTORS:**

- A. GENERAL: Provide raceways and conductors complying with applicable Division-26 Basic Materials and Methods sections.
- B. WALL AND FLOOR SEALS: Provide wall and floor seals complying with Division-26 Basic Materials and Methods section "Raceways".
- C. Fluidized thermal backfill (FTB): Provide fluidized thermal backfill (FTB) around service lateral conduits (Service Lateral: Conductors/conduits between RMP transformer and meter. See NEC Article 230) when there are seven or more conduits specified. FTB shall comply with requirements of RMP Electrical Service Requirements.

## **PART 3 – EXECUTION**

### **3.1 INSTALLATION OF SERVICE-ENTRANCE EQUIPMENT:**

- A. Install service-entrance equipment as indicated, in accordance with manufacturer's written instructions, and with recognized industry practices, to ensure that service-entrance equipment fulfills requirements. Comply with applicable installation requirements of NEC and NEMA standards.
- B. Coordinate with other work, including utility company wiring, as necessary to interface installation of service-entrance equipment work with other work.
- C. Install all floor standing service equipment on 4" high concrete curb and bolt equipment to curb with 3/8" anchors at each corner and at intervals not to exceed 8' along perimeter. Install concrete wiring trench under floor standing equipment; 12" deep, and 4" smaller in length and width than equipment base. Install grounding bushings on conduits penetrating trench.

### **3.2 GROUNDING:**

- A. Provide system and equipment grounding and bonding connections for service-entrance equipment and conductors, as required.

### **3.3 ADJUST AND CLEAN:**

- A. Adjust operating mechanisms for free mechanical movement.
- B. Touch-up scratched or marred enclosure surfaces to match original finishes.

### **3.4 FIELD QUALITY CONTROL:**

- A. Upon completion of installation of service-entrance equipment and electrical circuitry, energize circuitry and demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.

**END OF SECTION 26 2713**

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**SECTION 26 2726**

**WIRING DEVICES**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-26 section making reference to wiring devices specified herein.

**1.2 DESCRIPTION OF WORK:**

- A. The extent of wiring device work is indicated by drawings and schedules. Wiring devices are defined as single discrete units of electrical distribution systems that are intended to carry but not utilize electric energy.
- B. Types of electrical wiring devices in this section include the following:
  - 1. Receptacles
  - 2. Switches
  - 3. Timer Switches
  - 4. 0-10V & ELV LED LAMP DIMMERS
  - 5. Cord caps
  - 6. Cord connectors
  - 7. Flat Panel Display Wall Box

**1.3 QUALITY ASSURANCE:**

- A. Comply with NEC and NEMA standards as applicable to construction and installation of electrical wiring devices. Provide electrical wiring devices that have been UL listed and labeled.

**1.4 SUBMITTALS:**

- A. Refer to Section 260502 for electrical submittal requirements.

**PART 2 - PRODUCTS**

**2.1 FABRICATED WIRING DEVICES:**

- A. GENERAL:
  - 1. Provide factory-fabricated wiring devices, in types, and electrical ratings for applications indicated and complying with NEMA Stds. Pub No. WD 1.
- B. Provide wiring devices (of proper voltage rating) as follows:

|             | <u>RECEPTACLE</u> | <u>SWITCHES</u> |              |              |                |
|-------------|-------------------|-----------------|--------------|--------------|----------------|
| <u>MFGR</u> |                   | <u>1-POLE</u>   | <u>3-WAY</u> | <u>4-WAY</u> | <u>W-PILOT</u> |



|              |         |          |          |          |             |
|--------------|---------|----------|----------|----------|-------------|
| Hubbell      | BR20XTR | HBL 1221 | HBL 1223 | HBL 1224 | HBL 1221-PL |
| Bryant       |         | 1221     | 1223     | 1224     | 1221-PL     |
| Pass Seymour | TR63X   | 20AC1    | 20AC3    | 20AC4    | 20AC1-RPL   |
| Leviton      | TWR20-X | 1221     | 1223     | 1224     |             |
| Cooper       | TR5362  | 1221     | 1273     | 1224     | 1221-PL     |

C. Provide devices in colors selected by Architect. Provide red devices on all emergency circuits.

D. SURGE PROTECTIVE (SPD) RECEPTACLES:

1. Provide SPD receptacles having 4 series parallel 130V MOV's capable of a minimum of 140 joules suppression. Provide units with visual (and audible) surge status indicators to monitor condition of surge circuit; visual indicator to be "on" when power present and suppression circuit is fully functional. (Audible indicator shall sound a "beep" alarm approximately every 30 seconds if suppression circuit has been damaged.) Provide NEMA 5-20R, 20 amp, 125V receptacle of one of the following manufacturers:

| <u>SPECIFICATION GRADE</u>             | <u>MANUFACTURER</u> |                     |
|--|---------------------|---------------------|
|  | <u>HUBBELL</u>      | <u>PASS SEYMOUR</u> |
| Duplex Recept-Visual only              | 5350                | 5352 XXXSP          |
| Duplex Recept-Visual/Audible           | 5352                | 5362 XXXSP          |
| Single Recept-Visual only              | 5351                | N/A                 |
| Duplex Recept-Isol Gnd, Visual/Audible | IG5352S             | IG5362 XXXSP        |
| Single Recept-Isol Gnd, Visual only    | IG5351S             | N/A                 |
| <u>HOSPITAL GRADE</u>                  | <u>HUBBELL</u>      | <u>PASS SEYMOUR</u> |
| Duplex Recept-Visual/Audible           | 8300HS              | 8300 XXXSP          |
| Single Recept-Visual only              | 8310HS              | N/A                 |
| Duplex Recept-Isol Gnd, Visual/Audible | IG8300HS            | IG8300 XXXSP        |
| Single Recept-Isol Gnd, Visual only    | IG8310HS            | N/A                 |

2. Provide (1) SPD receptacle in all Flat Panel Display Wall Boxes ('DP' symbol)
3. Color of devices selected by Architect. Provide red devices on all emergency circuits.

E. GROUND-FAULT INTERRUPTER:

1. Provide general-duty, duplex receptacle, ground-fault circuit interrupters; feed-thru types, capable of protecting connected downstream receptacles on single circuit; grounding type UL-rated Class A, Group A, 20-amperes rating; 120-volts, 60 Hz; with solid-state ground-fault sensing and signaling; with 5 milliamperes ground-fault trip level; color as selected by Architect. Provide Hospital grade where required elsewhere by specification or drawings. Provide units of one of the following:
  - a. P&S/Sierra
  - b. Hubbell

- c. Leviton
- d. Square D

F. USB RECEPTACLE

1. Provide duplex receptacle with two (2) USB 3.0 amps, 5VDC, 2.0 Type A charging ports.
2. Provide products of one of the following:
  - a. Bryant – USB20-X
  - b. Cooper – TR7736-X
  - c. Hubbell – USB20X2-X
  - d. Legrand – TR5362USB-X
  - e. Leviton – T5832-X

G. TAMPER RESISTANT RECEPTACLES:

1. Per OSD, no tamper resistant receptacles shall be provided.

H. WEATHER-RESISTANT RECEPTACLES

1. Provide weather-resistant receptacles in outdoor locations such as under roofed open porches, canopies, marquees, etc.
2. Provide products of one of the following:
  - a. Pass & Seymour 2095TRWRXXX.
  - b. Hubbell GFTR20XX

I. CORD CAPS AND CONNECTORS:

1. Provide 3, 4 and 5-wire grounding, cap plugs, and connectors of ampere and voltage rating required, for final equipment, and as indicated otherwise on drawings.
2. Provide products of one of the following:
  - a. Cooper
  - b. General Electric
  - c. Hubbell
  - d. Leviton
  - e. P&S

J. TIMER SWITCH:

1. Provide a timer switch with the following features and functionalities. Provide switch that mounts in a standard wall box. Provide a Decora style cover plate that matches the other switches on the project. Provide color of switch chosen by Architect.
  - a. Provide Digital time switches that automatically turn lights off after a preset time. User programmable wall switch for astronomical and scheduled control. Electroluminescent back-lit LCD shows timer countdown. Compatible with all electronic ballasts, ELV, MLV, LED, and motor loads.

- i. Wattstopper TS-400: 120/277VAC; 50/60 Hz
      - ii. Greengate
    - b. Provide Astronomical time switches that automatically turns lighting or other loads on and off according to user programming. Time-out settings range shall range from 5 minutes to 12 hours for flexibility. Electroluminescent back-lit LCD shows timer countdown. Compatible with all electronic ballasts, ELV, MLV, LED, and motor loads. Program schedule per the owner's requirements.
      - i. Wattstopper RT-200: 120/277VAC; 50/60 Hz
- K. 0-10V & ELV LED LAMP DIMMERS:
- 1. Provide single-pole, semi-conductor modular type 0-10V control for 0-10V fluorescent ballasts/LED drivers & 3-wire fluorescent ballast/LED driver dimmers for fixtures; 60 hertz, with wattage and voltage as indicated, continuously adjustable slider control, and with electromagnetic filters to reduce noise and interference to minimum. Construct with continuously adjustable trim potentiometer for adjustment of low end dimming. Dimmer shall match lamp/ballast combination. Color as selected by Architect. Provide devices manufactured by one of the following:
    - a. Pass & Seymour (Titan Series)
    - b. Lutron (Nova Series)
    - c. Lutron (Diva Series)

**2.2 WIRING DEVICE ACCESSORIES:**

A. WALL PLATES:

- 1. Provide stainless steel cover plates in all finished areas. Provide galvanized steel plates in unfinished areas. Provide blank coverplates for all empty outlet boxes.

B. WEATHER-PROTECTING DEVICE ENCLOSURES:

- 1. Where required for compliance with NEC 406-8 (receptacles installed outdoors for use other than with portable tools or equipment), provide weather-tight device covers that provide complete protection with the cord and cap inserted into the wiring device. Provide units that mount on either single or double gang devices.
- 2. Provide products of one of the following extra-duty low-profile expandable in-use weatherproof covers for exterior mounted installations:
  - a. Intermatic:
    - i. WP7000W Single-Gang/White Cover
    - ii. WP7000G Single-Gang/Gray Cover
    - iii. WP7000BR Single-Gang/Brown Cover
    - iv. WP7200W Double-Gang/White Cover
    - v. WP7200G Double-Gang/Gray Cover
    - vi. WP7200BR Double-Gang/Brown Cover
  - b. TayMac:

- i. ML500W Single-Gang/White Cover
    - ii. ML500G Single-Gang/Gray Cover
    - iii. ML500Z Double-Gang/Brown Cover
    - iv. ML2500G Single-Gang/Gray Cover
  - c. Color chosen by architect.
- 3. Provide products of one of the following for roof mounted installations:
  - a. Intermatic WP1020 or WP1030
  - b. P&S WIUC10C or WIUC20c

**2.3 FLAT PANEL DISPLAY WALL BOX:**

- A. Provide a factory assembled display wall box made of 14 gauge steel. Wall box shall have provisions for a UL Listed single gang box for mounting of duplex receptacle and additional back box with a minimum of (1) 1 ¼" conduit opening to allow for low voltage terminations. Coordinate low voltage plate configuration with drawings. Provide device manufactured by one of the following:
  - 1. Stud Walls:
    - a. FSR Metal Products – PWB-100
      - i. Provide additional PN: 54406 Low-Voltage Conduit Entry Box (as required for conduit entry from top/bottom)
    - b. FSR Metal Products – PWB-FR-450 (Use at fire rated walls)
  - 2. Masonry Walls
    - a. FSR Metal Products – PWB-CMU8

**PART 3 – EXECUTION**

**3.1 GENERAL**

- A. Install wiring devices as indicated, in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation" and in accordance with recognized industry practices to fulfill project requirements.
- B. Coordinate with other work, including painting, electrical box and wiring work, as necessary to interface installation of wiring devices with other work. Install devices in boxes such that front of device is flush and square with coverplate. Drawings are small scale and, unless dimensioned, indicate approximate locations only of outlets, devices, equipment, etc. Locate outlets and apparatus symmetrically on floors, walls and ceilings where not dimensioned and coordinate with other work. Verify all dimensioned items on job site. Consult architectural cabinet, millwork, and equipment shop drawings before beginning rough-in of electrical work. Adjust locations of all electrical outlets as required to accommodate work in area, and to avoid conflicts with wainscoat, back splash, tackboards, and other items.
- C. Where stranded conductors have been utilized, provide solid pigtails to terminate at device.
- D. Provide receptacles in surface raceway at 12" on center unless indicated otherwise.
- E. Install wiring devices only in electrical boxes that are clean; free from excess building materials, dirt, and debris.
- F. Install blank plates on all boxes without devices.

- G. Delay installation of wiring devices until wiring work and painting is completed. Provide separate neutral conductor from panel to each GFI receptacle.
- H. Install GFI receptacles for all receptacles installed in the following locations:
  - 1. Restrooms, locker rooms, kitchens, within 6 feet of any sink, or when serving vending machines and electric drinking fountains.
  - 2. Indoor wet locations, non-dwelling garages, elevator rooms and pits.
  - 3. Outdoors, and on rooftops.
  - 4. Dwelling unit garages, crawlspaces and unfinished basements, accessory buildings, boathouses, and receptacles for boat hoists.
  - 5. Label all receptacles (non-GFI), protected downstream of a GFI receptacle or protected by GFI circuit breaker, with an indication that it is protected.
- I. Where light switches or wall box dimmers are specified, provide a separate neutral for each phase of the branch circuits that switches or dimmers are connected.
- J. Electrical Identification: Refer to Section 260553 for requirements.

**3.2 PROTECTION OF WALL PLATES AND RECEPTACLES:**

- A. At time of substantial completion, replace those items, that have been damaged, including those stained, burned and scored.

**3.3 GROUNDING:**

- A. Provide electrically continuous, tight grounding connections for wiring devices, unless otherwise indicated.

**3.4 TESTING:**

- A. Prior to energizing circuitry, test wiring devices for electrical continuity and proper polarity connections. After energizing circuitry, test wiring devices to demonstrate compliance with requirements.

**END OF SECTION 26 2726**

## SECTION 26 2815

### OVERCURRENT PROTECTIVE DEVICES

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-26 section making reference to overcurrent protective devices specified herein.

##### 1.2 DESCRIPTION OF WORK:

- A. Extent of overcurrent protective device work is indicated by drawings and schedules and specified herein. Overcurrent protective devices specified herein are for installation as individual components in separate enclosures; and for installation as integral components of switchboard and panelboards. See Section 262413, Switchgear and Switchboards, and Section 262416, Panelboards.
- B. Types of overcurrent protective devices in this section include the following for operation at 600 Volts and below:
  - 1. Molded case thermal circuit breakers
  - 2. Molded case solid-state circuit breakers
  - 3. Insulated case circuit breakers
  - 4. Power circuit breakers
  - 5. Fuses
- C. Refer to other Division-26 sections for cable/wire and connector work required in conjunction with overcurrent protective devices.

##### 1.3 QUALITY ASSURANCE:

- A. Comply with NEC requirements and NEMA and ANSI standards as applicable to construction and installation of overcurrent devices.

##### 1.4 SUBMITTALS:

- A. Refer to Section 260502 for electrical submittal requirements.

#### PART 2 – PRODUCTS

##### 2.1 ACCEPTABLE MANUFACTURERS:

- A. Subject to compliance with requirements, provide products of one of the following (main and branch device manufacturer must be same as panelboard and/or switchboard manufacturer):
- B. CIRCUIT BREAKERS AND FUSIBLE SWITCHES:
  - 1. Cutler Hammer Products, Eaton Corp.
  - 2. General Electric Co.
  - 3. Square D Co.

4. Siemens Energy and Automation
- C. MOLDED CASE THERMAL TRIP CIRCUIT BREAKERS:
1. Provide factory-assembled, molded case circuit breaker for power distribution panelboards and switchboards; and for individual mounting, as indicated. Provide breakers of amperage, voltage, and RMS interrupting rating shown, with permanent thermal trip and adjustable instantaneous magnetic trip in each pole. Series rated systems are not acceptable. Construct with overcenter, trip-free, toggle type operating mechanisms with quick-make, quick-break action and positive handle indication. Construct breakers for mounting and operating in any physical position and in an ambient temperature of 40 degrees C. Provide with mechanical screw type removable connector lugs, AL/CU rated, of proper size to accommodate conductors specified.
  2. Circuit breakers 15 amps through 399 amps shall be molded case thermal trip circuit breakers.
- D. MOLDED CASE SOLID-STATE CIRCUIT BREAKERS:
1. Provide factory-assembled, molded case solid-state circuit breakers for power distribution switchgear and switchboards. Provide breakers of amperage, voltage and RMS interrupting rating shown, and with solid-state trip mechanisms. Breakers shall be UL listed for application at 100% of their continuous ampere rating.
  2. Circuit breakers 400 amps through 1199 amps shall be molded case solid-state circuit breakers.
  3. Solid-state trip mechanisms shall have the following functions: Adjustable long time ampere rating; adjustable long time delay; adjustable short time pick up; adjustable short time delay and adjustable instantaneous pick up.
- E. INSULATED CASE CIRCUIT BREAKERS
1. Provide factory-assembled, insulated case circuit breakers for power distribution switchgear and switchboards. Provide breakers of amperage, voltage and RMS interrupting rating shown, with solid-state trip mechanisms and with manual spring charging mechanism. Breakers shall be UL listed for application at 100% of their continuous ampere rating.
  2. Circuit breakers 1200 amps and larger shall be insulated case circuit breakers.
  3. Solid-state trip mechanisms shall have the following functions: Adjustable long time ampere rating; adjustable long time delay; adjustable short time pick up; adjustable short time delay and adjustable instantaneous pick up.
  4. On service disconnect breakers where phase to ground voltage exceeds 150V and the breaker is capable of being set at or over 1000A (and also where GFP protection is indicated on the one line diagram for downstream breakers), the solid-state trip mechanism shall also include the following:
    - a. Adjustable ground fault pick up and adjustable ground fault time delay, and ground fault test button.
    - b. Over/under voltage trip
    - c. Current imbalance trip
  5. Provide an energy-reducing maintenance switch with local, lit status indicator to allow for a reduction of the instantaneous pickup and instantaneous delay settings for use during maintenance. Device shall mount in face of dead-front. The switch shall be provided by the same manufacturer as the circuit breaker.

6. Include integral phase failure (single-phasing) protection where phase failure (PF) is indicated on the one line diagram
- F. PHASE FAILURE PROTECTION:
1. Provide phase failure protection on overcurrent protective devices as indicated, by means of a single-phase, dead phase, reverse phase relay (Taylor Electronics Md1 PNDR). Provide relay to operate shunt trip or capacitor trip as required to open overcurrent protective device upon malfunction. Provide relay with adjustable time delay.
- G. GROUND FAULT PROTECTION:
1. Provide ground fault sensing and relaying equipment on all overcurrent protective devices where phase to ground voltage is in excess of 150 volts and the overcurrent protection device is capable of being set at or over 1000 amps. Provide ground fault sensing and relaying equipment on other devices as indicated.
  2. Provide zero sequence current sensors for overcurrent protective devices; inputs compatible with relay. Construct sensor frame so it can be opened to prevent removal or installation around conductors without disturbing conductors. Provide test winding in sensor for testing operation of GFP unit including sensor pick-up relay, and circuit protection device operation.
  3. Provide solid-state ground-fault relay, that requires no external source of electrical power, drawing energy to operate GFP system directly from output of current sensor. Construct with adjustable pick-up current sensitivity for GF current from 200 to 1200 amperes, with calibrated dial to show pick-up point settings. Provide factory-set time delay of 1.5 seconds and protection that precludes tampering with setting after installation.
  4. Provide monitor panel capable of indicating relay operation, and provide means for testing system with or without interruption of service. Construct so GF system can not be left in an inactive or OFF state. Provide indicator lamps and TEST and RESET control switches.
  5. MANUFACTURER: Subject to compliance with requirements, provide ground-fault sensing and relaying equipment of one of the following:
    - a. General Electric Co.
    - b. Brown Boveri Electric, Inc.
    - c. HI-Z Corporation
    - d. Pringle Electric Mfg. Co.
    - e. Square D Co.

## 2.2 FUSES:

- A. GENERAL: Except as otherwise indicated, provided fuses of type, sizes and ratings and electrical characteristics of a single manufacturer as follows. Provide fuses labeled UL Class L or UL Class R, current limiting and rated for up to 200,000 amperes. Provide Buss KAZ signal activating fuses where required elsewhere in specification.
- B. Where fuses are shown feeding individual or groups of equipment items, comply with manufacturer's recommendation for fusing; adjust fuse size and type as necessary to comply with manufacturer's recommendation.
- C. Provide and install spare fuse cabinet in main electrical room.
- D. MAIN SERVICE AND FEEDER CIRCUITS: For fuse ratings over 600 amperes provide UL Class L Fuses (KRP-C, or A4BQ or LCL or KLPC). For fuse ratings up to 600 amperes, provide UL Class RK1 (KTN-R, KTS-R or A2K-R, A6K-R or NCCR, SCLR or KLN-R, KLS-R). If fuse directly feeds motors, transformers or other inductive load provide UL RK5 time delay (FRN-R, FRS-R or TR-R, TRS-R or ECN-R, ECS-R or FLN-R, FLS-



- R).
- E. BRANCH CIRCUITS: For motor circuits, transformer circuits, or other inductive loads, provide UL Class RK5 (FRN-R, FRS-R or TR-R, TRS-R or ECN-R, ECN-S or FLN-R, FLS-A). For other circuits, provide UL Class RK1, (KTN-R, KTS-R OR A2K-R, A6K-R or NCLR, SCLR OR KLNR, KLSR).
  - F. MANUFACTURER: Subject to compliance with requirements, provide fuses of one of the following:
    - 1. Bussman Mfg. Co.
    - 2. Mersen (Ferraz Shawmut)
    - 3. Reliance Fuse Div./Brush Fuse Inc.
    - 4. Littlefuse, Inc.

### **PART 3 – EXECUTION**

#### **3.1 INSTALLATION OF OVERCURRENT PROTECTIVE DEVICES:**

- A. Install overcurrent protective devices as indicated, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with NEC and NEMA standards for installation of overcurrent protective devices.
- B. Coordinate with work as necessary to interface installations of overcurrent protective devices with other work.
- C. Install fuses in overcurrent protective devices. For motor circuits, fuse sizes shown on drawings are for general guidance only. Size fuses in accordance with fuse manufacturer's recommendation for given motor nameplate ampere rating. Test operation. If nuisance tripping occurs, increase fuse size and disconnect device (if necessary) as required to provide nuisance free tripping. Adjust fuse size properly for ambient temperature, frequent starting and stopping of motor loads, and for loads with long start times. Include all costs in bid.
- D. After the switchgear is energized and just prior to Substantial Completion, the contractor shall ensure that the field-adjustable circuit breakers and solid-state circuit breakers and associated trip mechanisms have been set to the appropriate settings as recommended by the equipment Manufacturer (or as recommended by the electrical contractor's Protective Device Study if section 260573 has been included in the project). Time-current trip curves and trip setting information as was required in the Submittal portion of this specification shall be made available by the contractor at this time. Provide adjustments to circuit breakers and switchboard AIC ratings as deemed necessary by the analysis/report, with no additional cost to the Owner. Provide over current protection devices with larger frame sizes to ensure coordination has been achieved.
- E. Field test all ground fault protective devices for proper operation; test to be performed by representative of the manufacturer. Include verification of complete time current trip characteristics.
- F. Electrical Identification: Refer to Section 260553 for requirements.

#### **3.2 FIELD QUALITY CONTROL**

- A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.

**END OF SECTION 26 2815**

## SECTION 26 2816

### MOTOR AND CIRCUIT DISCONNECTS

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is part of each Division-26 section making reference to motor and circuit disconnect switches specified herein.

##### 1.2 DESCRIPTION OF WORK:

- A. Extent of motor and circuit disconnect switch work is indicated by drawings and schedule. Work includes complete installations and electrical connections.

##### 1.3 QUALITY ASSURANCE:

- A. Provide motor and circuit disconnect switches that have been UL listed and labeled. Comply with applicable requirements of NEMA Standards Pub. No. KS 1, and NEC.

##### 1.4 SUBMITTALS:

- A. Refer to Section 260502 for electrical submittal requirements.

#### PART 2 - PRODUCTS

##### 2.1 ACCEPTABLE MANUFACTURERS:

- A. MANUFACTURER: Subject to compliance with requirements, provide products of one of the following (for each type of switch):
  - 1. Cutler Hammer Products, Eaton Corp.
  - 2. Square D Company
  - 3. General Electric Company
  - 4. Siemens Energy & Automation, Inc.
  - 5. Cooper Bussmann

##### 2.2 FABRICATED SWITCHES:

- A. GENERAL: Provide disconnect and safety switches as indicated herein. Provide:
  - 1. General duty switches on 240 Volt rated circuits.
  - 2. Heavy duty switches on 480 volt rated circuits.
  - 3. HP rated switches on all motor circuits.
- B. GENERAL DUTY SWITCHES: Provide general-duty type, sheet-steel enclosed switches, fusible or non-fusible as indicated of types, sizes and electrical characteristics indicated; rated 240 volts, 60 hertz; incorporating spring assisted, quick-make, quick-break mechanisms. Provide single phase or three phase and with solid neutral as required by application. Equip with operating handle that is capable of being padlocked in OFF

position. Provide NEMA 1 or NEMA 3R as required by application, unless noted. Provide fusible switches with Class R rejection fuse clip kits.

- C. HEAVY-DUTY SWITCHES: Provide heavy-duty type, sheet-steel enclosed safety switches, fusible or non-fusible as indicated, of types, sizes and electrical characteristics indicated; rated 600 volts, 60 hertz; incorporating quick-make, quick-break type mechanisms. Provide single phase or 3 phase, and with solid neutral as required by application, Equip with operating handle that is capable of being padlocked in OFF position. Provide NEMA 1 or NEMA 3R as required by application unless noted. Provide fusible switches with Class R rejection fuse clip kits.
- D. FUSES: Provide fuses for switches, as required of classes, types and ratings needed to fulfill electrical requirements for service indicated. Provide spare fuses amounting to one spare fuse for each 10 installed but not less than three of any one type and size. See Section 262815 Overcurrent Protective Devices for fuse types.
- E. Electrical Identification: Refer to Section 260553 for requirements.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION OF MOTOR AND CIRCUIT DISCONNECT SWITCHES:**

- A. Install motor and circuit disconnect switches where indicated, complying with manufacturer's written instructions, applicable requirements of NEC, NEMA, and NECA's "Standard of Installation" and in accordance with recognized industry practices to ensure that products fulfill requirements.
- B. Coordinate motor and circuit disconnect switch installation work with electrical raceway and cable work, as necessary for proper interface.
- C. Install disconnect switches used with motor driven appliances, and motors and controllers within sight of controller position.
- D. For disconnect switches serving motors controlled by variable frequency drives, provide late-make, early-break auxiliary contacts on each disconnect switch. Provide Heavy-Duty switch. Wire auxiliary contact to VFD safety contact, such that disconnecting the motor will shut down the drive first, and closing the switch will start the drive only after power is applied to the motor.
- E. For all disconnect switches serving single elevator applications, provide a Cooper Bussman Quik-Spec™ Power Module™ Switch.
  - 1. Elevator Shutdown
  - 2. Shunt Trip Voltage Monitoring
  - 3. Selective Coordination
  - 4. Fire safety signal interface
  - 5. Auxiliary Contact (Hydraulic Elevator)
    - a. Wire auxiliary contact to auxiliary power such that disconnecting the motor will disconnect the auxiliary power.

**END OF SECTION 26 2816**

## SECTION 26 2913

### MOTOR STARTERS

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Materials and Methods section, and is part of Division-26 sections making reference to motor starters specified herein.

##### 1.2 DESCRIPTION OF WORK:

- A. Extent of motor starter work is indicated by drawings and schedules.
- B. Types of motor starters in this section include the following:
  - 1. AC Fraction Horsepower Manual Starters
  - 2. AC Line Voltage Manual Starters
  - 3. AC Non-Reversing Magnetic Starters
  - 4. AC Combination Non-Reversing Magnetic Starters

##### 1.3 QUALITY ASSURANCE:

- A. Comply with NEC and NEMA Standards as applicable to wiring methods, construction and installation of motor starters. Comply with applicable requirements of UL 508, "Electric Industrial Control Equipment", pertaining to electrical motor starters. Provide units that have been UL-listed and labeled.

##### 1.4 SUBMITTALS:

- A. Refer to Section 260502 for electrical submittal requirements.

#### PART 2 - PRODUCTS

##### 2.1 MANUFACTURER:

- A. Subject to compliance with requirements, provide products of one of the following (for each type and rating of motor starter):
  - 1. Allen-Bradley Co.
  - 2. Appleton Electric Co.
  - 3. Crouse-Hinds Co.
  - 4. Eaton Corp., Cutler Hammer Products
  - 5. General Electric Co.
  - 6. Siemens Energy & Automation, Inc.
  - 7. Square D Co.
- B. MAINTENANCE STOCK, FUSES: For types and ratings required, furnish additional fuses, amounting to one unit for every 10 installed units, but not less than 5 units of each, for both power and control circuit fuses.

## 2.2 MOTOR STARTERS:

- A. GENERAL: Except as otherwise indicated, provide motor starters and ancillary components; of types, sizes, ratings and electrical characteristics indicated that comply with manufacturer's standard materials, design and construction in accordance with published information and as required for complete installations.
- B. THERMAL OVERLOAD UNITS: Provide thermal overload units, sized to actual running full load current, not to motor plate current. Size heaters for mechanical equipment after air and water balancing have been completed.
- C. AC FRACTIONAL HP MANUAL STARTERS (EQUAL TO SQUARE D CLASS 2510): Provide manual, single-phase, 1 and 2 pole, 300 volt AC max, fractional HP motor starters, of types, ratings and electrical characteristics indicated; equip with one piece thermal overload relay with field adjustment capability of plus or minus 10 percent of nominal overload heater rating; for protection of AC motors of 1 HP and less. (For manually controlled motors in excess of 1 HP, see Line Voltage Manual Starters specified herein). Provide starter with quick-make, quick-break trip free toggle mechanisms, green pilot lights, and with lock-off toggle operated handle. Mount surface units in NEMA 1 enclosures, unless noted otherwise. Provide NEMA 3R enclosure in exterior or damp location unless noted otherwise. Provide flush mounted units with coverplate to match wiring device coverplates.
- D. AC LINE VOLTAGE MANUAL STARTERS (EQUAL TO SQUARE D CLASS 2510): Provide line voltage manual starters, of types, ratings and electrical characteristics indicated; 2 or 3 pole, 600 volt AC max; equip with pushbutton operator, low voltage protection feature, and green pilot light. Provide starters with trip free mechanism such that contacts will open under load and remain open until thermal element has cooled, and unit is reset. Mount surface units in NEMA 1 enclosure, unless noted otherwise. Provide NEMA 3R enclosure in exterior or damp location, unless noted otherwise. Provide overlapping trim for flush mounted units.
- E. AC NON-REVERSING MAGNETIC STARTERS (EQUAL TO SQUARE D CLASS 8536): Provide line voltage magnetic starters, of types, ratings and electrical characteristics indicated; 2 or 3 pole, 600 volt max, with thermal overload protection in all phases and inherent under voltage release. Equip units with holding contact, 2 normally open, and 2 normally closed auxiliary contacts, unless noted otherwise. Provide fused control transformer in each starter and 120V control coil. Mount hand-off-auto switch, red pilot light, and reset button in face of enclosure. Provide NEMA 1 enclosure unless noted otherwise. Provide NEMA 3R enclosure in exterior or damp location, unless noted otherwise. Equip all spare starters complete with items as specified herein.
- F. AC COMBINATION NON-REVERSING MAGNETIC STARTERS (EQUAL TO SQUARE D CLASS 8539): Provide line voltage combination starters, of types, ratings and electrical characteristics indicated; 2 or 3 pole, 600 volts max with non-reversing magnetic starters as specified herein; in common cubicle or enclosure with motor circuit protector. Provide motor circuit protector, instantaneous trip circuit breaker as indicated and adjust to comply with manufacturer's recommendations. Mount hand-off-auto switch, red pilot light, and reset button in face of enclosure. Provide combination starters for individual mounting, or for group mounting in motor control center as indicated. Provide NEMA 3R enclosure in exterior or damp locations, unless noted otherwise. Provide NEMA 1 enclosures unless otherwise indicated.
- G. AC COMBINATION NON-REVERSING MAGNETIC STARTERS (EQUAL TO SQUARE D CLASS 8538): Provide line voltage combination starters, of types, ratings, and electrical characteristics; 2 or 3 pole, 600 volt maximum with non-reversing magnetic starters as specified herein; in common cubicle or enclosure with fusible disconnect switch. Provide quick-make, quick-break, disconnect for NEMA sizes 1, 2, 3, and 4; and visible blade, automatic circuit interrupters with push-to-trip feature and separate fuse

clips for larger NEMA sizes. Fuse all starters with dual-element (time-delay) fuses equal to Bussman FRN/FRS-R. Equip disconnect switch with Class R rejection fuse kits. Mount hand-off-auto switch, red pilot light, and reset button in face of enclosure. Provide combination starters for individual mounting, or for group mounting in motor control centers as indicated. Provide NEMA 1 enclosures unless otherwise indicated. Provide NEMA 3R enclosure in exterior or damp locations, unless noted otherwise.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION OF MOTOR STARTERS:**

- A. Install motor starters as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC, NEMA standards, and NECA's "Standards of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.
- B. Install fuses in fusible disconnects, if any. Mount chart inside each starter indicating heater type, size, and ampere ratings available.
- C. Electrical Identification: Refer to Section 260553 for requirements.

#### **3.2 ADJUST AND CLEAN:**

- A. Inspect operating mechanisms for malfunctioning and, where necessary, adjust units for free mechanical movement.
- B. Touch-up scratched or marred surfaces to match original finish.

#### **3.3 FIELD QUALITY CONTROL:**

- A. Subsequent to wire/cable hook-up, energize motor starters and demonstrate functioning of equipment in accordance with requirements.

**END OF SECTION 26 2913**

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## SECTION 26 3100

### TURNKEY PHOTOVOLTAIC (PV) RENEWABLE ENERGY SYSTEM

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26 and 27 Materials and Methods sections apply to work specified in this section. Refer to main building packages specifications.

##### 1.2 DESCRIPTION OF WORK:

- A. Provide a turnkey system in a complete and operating condition with all necessary materials and labor to fulfill the requirements and the intent of the drawings and specifications. Except as otherwise indicated, provide manufacturer's standard system components. Contractor shall furnish all cables, materials and equipment, whether specifically mentioned herein or not, to ensure a complete and functional system.
  - 1. The PV system shall be a grid-tie system that interconnects to the building electrical distribution system. String inverters shall be provided as required. Plans initially have shown main building roof system for planning purposes. Final quantity and locations to be determined by contractor and coordinated with engineer.
  - 2. The PV system shall be installed by a qualified PV system supplier/installer.
  - 3. A site visit prior to bid and installation is required.
  - 4. Provide labor and materials as required to accomplish PV system installation in accordance with Rocky Mountain Power (RMP) company standards and requirements.
    - a. Complete and submit all documents required for RMP's private generation application system and net metering.
  - 5. Provide engineered stamped drawings, energy model, shop drawings, and project documentation. Refer to plans for anticipated inverter locations. Coordinate all needed equipment with available space in utility/electrical rooms.
  - 6. Provide all costs in bid for circuit breaker modifications, bus size increases, etc so that all costs are included in bid. Coordinate all interface with Division 26 Switchboards and Panelboards prior to release of electrical gear.
  - 7. Provide software interface to allow for owner monitoring of system production.
  - 8. The system shall include, but not be limited to, the following components:
    - a. Weatherproof 1000 VDC connection boxes, as required
    - b. Weatherproof 1000 VDC combiner boxes with fusing, sized as required
    - c. Lightning arresters, as required
    - d. Weatherproof 1000 VDC fused disconnect switch at roof level
    - e. Weatherproof 600 VDC outside safety switch (RMP Approved emergency disconnect) on building exterior at grade level (code required)
    - f. 1000 VDC input DC isolation switch at the inverter



- g. DC-to-AC grid-tie string inverter(s) as required
  - h. AC circuit breaker at PV system output in NEMA 1/3R enclosure.
  - i. DC interconnection cables between PV panels
  - j. Isolation transformer (if required) and transformer input safety switch or breaker (if required) on the inverter side of the transformer.
  - k. All DC power wiring and conduit.
  - l. Continuous ground conductor bolted to each PV panel.
  - m. PV panel mounting frames and racks
  - n. Accessories, junction boxes, enclosures and miscellaneous items as required for a complete system.
- B. The photovoltaic (PV) panels shall be mounted on the roof using an engineered ballasted roof mount system. Provide mounting system, frames and racks as required to support the PV panels at a 10 min – 20 max degree angles from the horizontal. Provide all appurtenances and components as required to fully and securely mount to and on the roofing material.
- C. The PV system shall comply with UL1741, IEEE-P929, IEEE 1547 and all other standards related to PV system manufacture and installation. Installation and wiring methods shall be in accordance with NEC Articles 250, 310 and 690.
- D. PV panel groupings and PV source circuits shall be arranged as required to provide the proper DC voltage level to the inverter input.
- E. PV panel interconnecting cables shall be copper, with special weather and sunlight resistant insulation, and USE-2 cables to the combiner boxes. All DC power conductors shall be copper, THWN insulation, rated 75 degrees Celsius. All power conductors shall be installed in conduit. All exterior conduits shall be rigid galvanized steel.
- F. Provide structural calculations, certified and stamped by structural engineer, for complete PV installation including all equipment and mounting systems. Calculations shall verify that the existing design will not compromise the building design.
- G. Workmanship throughout the installation shall be consistent from one PV array/rack to the next. Installation is expected to be neat, have a good mechanical appearance and conform to best electrical construction practices. Contractor shall submit conduit routing detail to engineer for review prior to rough-in/installation.
- H. Wiring and conduit from the output of the PV system to the building electrical distribution panelboard shall be by the Division 26 or by division 26 PV sub-contractor. Coordinate all work with Division 26 contractor.
- I. Coordinate all work with appropriate contractors so that roof warranty is not voided by PV installation.
- J. Monitoring and managing software: Provide manufacturer-approved/compatible monitoring and managing software. The software shall allow for web-based monitoring and control of the entire Tech Ridge 1.6 Campus with the ability to scale to other Tech Ridge Operated Campuses. Software features shall provide, but not limited to, solar production, energy consumption data, detailed performance data, manage multiple systems, comparing data, automatic emails or graphical maintenance issue, performance reports, secured user entry, social media interface, historical production (days, months, or hours), historical weather data, day to day performance information. GUI shall be easy to configure, simple, and mobile-friendly interface.
- K. Provide two monitoring/educational dashboard output stations. Station to display PV array information e.g. Production, Carbon Offset, etc. Coordinate with owner for exact location(s). Coordinate with owner for the exact interface requirements. Video output shall be connected to the digital signage system. Coordinate system video output with the general and AV contractors. Provide all material and labor to provide a complete and

working system.

### 1.3 QUALITY ASSURANCE:

- A. Installer:
  - 1. Contractor shall have worked satisfactorily for a minimum of (5) years of completing systems equal to this scope, size (35 kW larger), quality, type and complexity.
  - 2. Key personnel assigned to the project shall each have minimum of (10) years of experience in completing systems equal to this scope, quality, type and complexity.
  - 3. Contractor shall have experience in applying for and obtaining Federal and Local Rebates and help assist owner in filing for rebates.
  - 4. Contractor shall have experience in applying for and obtaining Rocky Mountain Power – Blue Sky Funding.
  - 5. Contractor shall be a factory authorized distributor of all equipment specified for the geographical area of the project.
  - 6. Contractor shall maintain complete installation and service facilities for the duration of the project contract.
  - 7. Contractor shall have current manufacturer certificates for all PV systems and equipment listed within this specification.
  - 8. Contractor shall be in good standing with owner based on previous projects.
  - 9. Contractors that do not meet the above requirements cannot bid on this project.
- B. Contractor must follow the standards described within:
  - 1. Contractor shall have a current state contracting license applicable to type of work to be performed under this contract.
    - a. General Electrical Contractor - E200
    - b. Solar Photovoltaic Contractor – E202
  - 2. NABCEP Certifications.
  - 3. A qualified firm must contract and work with an authorized by Sika Sarnafil to install all work pertaining to product manufacturer's solar mount
- C. All work shall be done by expert technicians qualified in the field with knowledge of specified systems. Workmanship shall comply with industry best practices concerning grounding, shielding, cable dressing, cable termination and equipment mounting.
- D. Comply with NEC as applicable to construction and installation of PV system components and accessories. Provide components that are UL-listed and labeled.
- E. Comply with FM approval for rigid photovoltaic materials class number 4478.
- F. Bids submitted by non-compliant installers will not be accepted. To submit to become an approved installer, submit in writing a list of qualifications, past and current projects and (3) different referrals from the owners of (3) different projects, (5) working days prior to bid.
  - a. List of qualifications including:
    - i. Industries certifications including manufacturers.
    - ii. Approved resale manufacturers.
  - b. Past and current projects within the last 5 years similar in scope and size.
  - c. (3) Different referrals from the owners of (3) different projects within the last 5 years.

## 1.4 SUBMITTALS:

### A. PRODUCT DATA:

1. Submit fully engineered, stamped drawings of system to be reviewed. Coordinate any changes to permit drawings with Division 26 contractor.
2. Submit manufacturer's data on all PV system components including, but not limited to, roughing-in diagrams, inverter schematic diagrams, and instructions for installation, operation and maintenance of major components, suitable for inclusion in maintenance manuals.
3. Submit a complete riser and interconnection wiring diagram that is specific to this installation.
4. Submit manufacturer's data on support frame and rack structure components, including attachment and anchor hardware, and structural calculations.
5. Energy Model. Provide a complete model showing estimated energy use for building and PV energy production data for a complete year including any anticipated reductions due to shading.
6. Utility Interconnect Documentation
7. Operation and Maintenance Data including warranty information.

## PART 2 - PRODUCTS

### 2.1 GENERAL:

- A. All equipment shall be installed as shown on the drawings and in strict accordance with the specifications and manufacturers instructions. Any errors, conflicts, or omissions discovered in the specifications or the drawings shall be submitted in writing to the engineer for clarification.
- B. Equipment lists are provided to set equipment expectations and may not be complete. Coordinate with devices shown on drawings, system risers, equipment list, and manufacturer for system intent and compatibility. Provide a complete and functional system as described within the construction documents and as required to provide a complete and functional system.

### 2.2 MANUFACTURER APPROVED EQUALS:

- A. Bidders wishing to provide equipment other than the equipment specified shall submit proposed substitute equipment to engineer (8) working days prior to bidding. Submittals for prior approval shall include description of equipment, design intent, complete riser diagrams for proposed equipment, equipment specifications, cut sheets of proposed equipment, reason for alternate equipment. Acceptance of proposed equipment by engineer shall not relieve PV contractor from responsibility to provide PV systems equal to those specified in this Section. Contractor shall be ultimately responsible for providing complete and working PV systems that function, control and operate in the same manner as the specified equipment. Engineer has final say if proposed equipment is equal to the specified equipment. Equipment that engineer is not familiar with will require the contractor to provide manufacturer training at the manufacturer's facility and have a manufacturer representative present at time of commissioning.
- B. The Manufacturers listed are the bases of design. Equals may be considered as it relates to the system design intent and the equipment specified herein. Any equipment chosen as equal to what has been specified in section 2 will be the responsibility of the PV Integrator to coordinate all resulting changes and guarantee a complete and functional system e.g. rough-in requirements, programming, etc. Please note that some components have been chosen over others for features and/or size limitations. The

equipment listed in section 2 with an asterisk have feature and/or size limitations and may not be substituted.

## 2.3 EQUIPMENT REQUIREMENTS

- A. Photovoltaic Panels
  - 1. Mono or multi crystalline silicon modules, 72 cell
  - 2. Rated for 485W output minimum, 1000V DC
  - 3. Factory installed junction box with factory locking connectors.
- B. String Inverter
  - 1. Output: 480V, 3-phase, 4 wire (full neutral) + ground, full sine wave, 60 Hz AC.
  - 2. Operating temperature: -20 to +50 degrees C.
  - 3. Relative humidity: to 95%, non-condensing
  - 4. Elevation: Derated above 6,600 feet.
  - 5. Microprocessor-based control, IGBT power components, closed loop PWM modulators, and electronic signal conditioning.
  - 6. Anti-island protection.
  - 7. UL listed (UL 1741)
  - 8. The inverter shall include internal fault interrupters and ground fault protection.
  - 9. The inverter shall include an on-off switch, LED indicator lights for inverter operating status, and an LCD operator interface panel and display.
  - 10. The LCD display shall also indicate a text description of inverter fault conditions, operating state, inverter output parameters such as daily and lifetime energy produced, real-time KW output, PV array voltage and current, utility voltage and frequency, etc.
  - 11. The inverter enclosure door shall be padlockable.
  - 12. The inverter shall synchronize to and operate in parallel with the building electrical system. The inverter shall sense a building distribution power failure (utility outage) and shall power-down to avoid feeding into a distribution system or utility fault. Inverter shall meet all requirements per IEEE 1547.
  - 13. Inverter shall comply with rapid-shut down requirements per NEC.
  - 14. Total harmonic distortion shall be less than 5%.
- C. Power Optimizers
  - 1. Provide factory-connected optimizers to the PV module.
- D. Monitoring Software
  - 1. Software shall provide system performance data through the site network system access.
  - 2. Data retrieved from the monitoring software shall include information such as CO2 savings, module/system output, trees saved, etc. Information shall be integrated so that information can be viewed through the Ogden School District web services.

## 2.4 ACCEPTABLE MANUFACTURERS:

- A. Basis of design and specifications includes SolarEdge Synergy Solution, UNIRAC Racking, and REC Solar Panels. Any additional manufacturer/installer listed below has the potential to be considered equals, as it relates to the system design intent and the equipment specified herein. The division 26 contractor utilizing a manufacturer/installer other than the basis of the design system will be responsible for coordinating all resulting

changes and guaranteeing a complete and functional system e.g. rough-in requirements, updated equipment list, programming, etc.

- B. Subject to compliance with requirements, provide components of the following manufacturers:
1. PV panels
    - a. Trina Solar Energy, TSM-485DE18M.08(II) (Vertex) (Basis of Design)
    - b. Hanwa Q-Cells
    - c. Solar World
    - d. LG
    - e. REC
  2. String Inverters
    - a. Solaredge Three Phase Inverter with Synergy Technology (Basis of Design)
    - b. SMA
  3. Power Optimizers
    - a. Solaredge P1101 Technology (Basis of Design)
    - b. SMA
  4. Monitoring Software
    - a. Solaredge Enterprise and Synergy Technology Technology (Basis of Design)
    - b. SMA

## **2.5 BALLASTED ROOF MOUNTING SYSTEM (ENGINEERED):**

- A. Provide a manufacturer engineered solutions compatible for PV building roof system (Self Ballasted). Contractor responsible for producing and meeting project specific engineered and stamped documents that meet or exceed national and local engineering requirements e.g. Wind Load Down, Ground Snow Load, Roof Snow Load, Wind Speed/Exposure, Seismic Factors, Roof Loads.
- B. All work shall be done by expert technicians qualified in the field with knowledge of specified systems. Workmanship shall comply with industry best practices concerning the installation of solar mount and racking system.

## **2.6 MISCELLANEOUS EQUIPMENT:**

- A. As required.
- B. Provide 4 spare replacement fuses for each size. Provide a fuse cabinet with hinged cover to contain replacement fuses. Locate the cabinet next to the inverter.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION OF PV SYSTEM:**

- A. Install PV system as indicated, in accordance with industry standards and equipment manufacturer's written instructions and complying with applicable portions of NEC and NECA's "Standard of Installation".
- B. Each PV panel will have an insulation board raising the system a minimum of 6" above the roof, thereby, avoiding metal contact with the roof. PV Panel will mount on a racking system per installation shop drawings. Coordination with roofing system manufacturers will be required prior to installation.
- C. Arrange PV array such that:

5. Modules are aligned with uniform spacing and access is provided to front and back for maintenance.
6. Roof drainage is not affected by array.
7. Mechanical equipment maintenance and installation is not affected by array.
8. Array does not span any expansion joints.
9. No shading occurs between rows of panels.
  - a. Shading from other adjacent obstacles should be taken into account in energy models prior to installation.
- D. Provide system to be compatible for wind loads, snow loads, seismic loads and other structural design. Comply with ASCE 7-10.
- E. Provide all conduit, cable, hardware, software, licensing for full system. Any annual subscriptions costs shall be provided to owner at time of submittal.
- B. Comply with all utility requirements for interconnection.
- C. Provide all necessary signage to equipment to satisfy all NEC, NFPA, OSHA, utility, and industry standard requirements.

### **3.2 INSTALLATION OF BASIC WIRING SYSTEM MATERIALS:**

- A. Install wiring, raceways, and electrical boxes and fittings in accordance with Division-26 Basic Materials and Methods sections, "Raceways", "Wires and Cables", and "Electrical Boxes and Fittings", NEC Articles 250, 310 and 690.
  1. Conduit Required:
    - a. RMC/IMC (Exterior)
    - b. EMT (Interior)
  2. Cabling/Wire
    - a. PV-Wire, 1kV/2kV:, 10 AWG or Larger as required, RPVU90 XLPE

### **3.3 LABELING:**

- A. The contractor shall meet all Identification, labeling, and signage requirements of the NEC 690.
- B. All labels shall meet UL 969 requirements for legibility, defacement and adhesion requirements. Handwritten labels are not allowed. All labels shall maintain consistent typeface, size and color.

### **3.4 FIELD QUALITY CONTROL:**

- A. Test system for proper functioning and where necessary, adjust units for proper operation to fulfill project requirements. Replace malfunctioning units and components.
- B. Final adjustments shall be performed by the PV system installer.

### **3.5 GROUNDING**

- A. Provide #6 bare copper ground clipped to each PV panel to the service entrance ground. Enclose in suitable raceway. Make connection at service entrance ground. See drawings for additional requirements.

### **3.6 SYSTEM START-UP AND OWNER TRAINING:**

- A. System installer shall provide recorded start-up services and Owner training.
- B. Start-up services shall demonstrate the proper operation of the system. Where possible, correct malfunctioning components on site, and re-test to demonstrate compliance.
- C. Provide a minimum of 6 hours of on-site Owner training after system start-up on the proper operation and maintenance of the system and its components. Coordinate training

session with Owner's representative and provide a minimum 7 days advance notice.

- D. Provide one monitoring/educational dashboard output stations. Coordinate with owner for exact locations. Coordinate with owner for the exact interface requirements. Video output shall be connected to the digital signage system. Coordinate system video output with the general and AV contractor. Provide all material and labor to provide a complete and working system.
- E. Provide 1 year re-commissioning and warranty walk-thru services. Correct and replace any malfunctioning part of the system or software.

**3.7 WARRANTY AND OPERATING/MAINTENANCE INSTRUCTIONS:**

- A. Provide the following warranties:
  - 1. PV panels: Limited power output warranty (90% of minimum power for 0-10 yrs; 80% of minimum power for 25 Years.
  - 2. Inverter: 25-years.
  - 3. Installer's warranty shall also comply with Division 26 0500.

**END OF SECTION 26 3100**

## SECTION 26 3213

### EMERGENCY ELECTRICAL SYSTEMS

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26 Basic Materials and Methods sections apply to work specified in this section.

##### 1.2 DESCRIPTION OF WORK:

- A. Extent of emergency electrical system work is indicated by drawings and schedules.
- B. Types of emergency system components specified in this section include the following:
  - 1. Automatic Transfer Switches (ATS)
  - 2. Emergency Generators (Diesel)
  - 3. Exhaust and Fuel Systems
  - 4. Remote Annunciator Panels
- C. CONDUCTORS/CABLES, RACEWAYS, AND ELECTRICAL BOXES AND FITTINGS are specified in applicable Division-26 Basic Materials and Methods sections.
- D. Refer to other Division-26 sections as applicable for work required in connection with emergency electrical systems.
- E. Refer to Division-23 sections for fuel tanks, piping and accessories required in conjunction with engine-generator units; not work of this section.

##### 1.3 QUALITY ASSURANCE:

- A. Comply with NEC as applicable to wiring methods, materials, construction and installation of emergency electrical systems. Comply with applicable requirements of UL 924, "Emergency Lighting and Power Equipment" and UL 1008, "Automatic Transfer Switches". Provide system components, that are UL-listed and labeled.
- B. Comply with applicable requirements of NFPA Nos. 37, (99), 101, and 110 pertaining to stationary combustion engines, (health care facilities), life safety code, and emergency and standby power supplies.
- C. Comply with ANSI/NEMA Std. Pub. No. ICS 2, pertaining to AC automatic transfer switches. Comply with applicable requirements of ANSI/NEMA MG 1, "Motors and Generators", and MG 2, "Safety Standard for Construction and Guide for Selection, Installation and Use of Electric Motors and Generators". Comply with applicable portions of IEEE Std. 241, "IEEE Recommended Practice for Electric Power Systems in Commercial Buildings" pertaining to standby power.

##### 1.4 SUBMITTALS:

- A. Refer to Section 260502 for electrical submittal requirements.



## **PART 2 – PRODUCTS**

### **2.1 GENERAL:**

- A. Provide emergency electrical systems and components, of types, ratings, and electrical characteristics indicated. Provide all system components thru one supplier to guarantee total system responsibility. Provide system and components capable of start and load transfer within 10 seconds of power outage.

### **2.2 ENVIRONMENTAL CONDITIONS:**

- A. Provide system components and accessories as required to ensure proper system operation at rated capacities under the following environmental conditions:
  - 1. Altitude: 4800 feet above sea level
  - 2. Maximum ambient temperature: 50 degrees C.
  - 3. Minimum ambient temperature: 0 degrees C.
  - 4. Seismic Zone as indicated in General Structural Notes.

### **2.3 AUTOMATIC TRANSFER SWITCHES:**

- A. Provide contactor type automatic transfer switches compatible with electric sets, and of continuous ampere rating sufficient to meet requirements of both maximum set output and normal power service. Switches that employ interlocking handles and circuit breakers to affect transfer are not acceptable. Provide 4 pole switches where distribution system is provided with ground fault protective relaying, or where indicated on drawings. Provide switches of voltage and phase indicated, and with the following features and characteristics:
  - 1. Provide precision calibrated voltage sensors to monitor the normal power source and signal the electric set to start on a partial loss of power on any phase or where feedback voltages exist. Provide adjustability to signal start-up when line voltage drops 5 percent to 20 percent below pick-up voltage setting, and to signal shutdown when line voltage returns to 75% to 100% of normal.
  - 2. Provide a time delay relay, adjustable from 1 to 10 seconds, to delay the signal to start to avoid nuisance start ups on momentary voltage dips or power outages.
  - 3. Provide voltage sensors to sense return of normal power; and a time delay, adjustable 2 to 60 minutes, to delay the retransfer of load to normal to avoid short term fluctuations in normal power restoration.
  - 4. Provide an engine cool-down timer, adjustable from 0 to 5 minutes, for unloaded engine cool-down time. Timer shall engage after retransfer to normal.
  - 5. Provide pilot light to indicate switch in normal position and pilot light to indicate switch in emergency position. Mount pilot lights in front face of enclosure.
  - 6. Obtain operating current for transfer and retransfer from the source that the load is to be transferred. Provide automatic bypass to retransfer the load from the electric set to the normal source if the electrical set output interrupts after normal source restores voltage.
  - 7. Provide switch to simulate an interruption of power from the normal source.
  - 8. Provide manual operator with removable handle for manual operation of the switch.
  - 9. Provide clock exerciser to automatically start the electrical set at regular intervals and allow it to run for a preset time period; minimum of 30 minutes per week.

- Equip with selector switch to permit selection of "without load" or "with load" operation.
10. Provide means to electrically disconnect the control section from the transfer switch for maintenance service during normal operation.
  11. Provide a battery charger mounted inside the transfer switch enclosure.
  12. Provide time delay neutral position transfer in both directions to allow transfer switch to be disconnected from both sources during transfer from one source to another. Time delay shall be adjustable from 0 to 5 seconds.
  13. Provide (3) sets of N.O./N.C. auxiliary contacts (in addition to those for remote Ann. panel) that operate when the transfer switch is in the normal position.
  14. Provide (3) sets of N.O./N.C. auxiliary contacts (in addition to those for remote Ann. panel) that operate when the transfer switch is in the emergency position.
  15. Provide ammeter with 4-position selector switch marked "Off", "1", "2", and "3" to read current in all three phases of the load circuit.]
- B. **RATING AND PERFORMANCE:** Rate automatic transfer switch for continuous duty when enclosed in a non-ventilated NEMA 1 enclosure. Rate switch for all classes of load, both inductive and non-inductive, at 600 volts; and tungsten lamp load at 205 volts.
  - C. Switch must be capable of closing into and withstanding fault current of 65,000 amperes RMS symmetrical at 600 volts, for units 225 amps and larger and 30,000 amperes RMS symmetrical on units 200 amps and less.
  - D. **CONSTRUCTION:** Provide operating mechanism with sufficient mechanical and electrical interlocks to prevent simultaneous energizing both normal and standby service. Provide main contacts with arc suppression and heat dissipation devices to provide dependable transfer of highly inductive loads. Equip switch with terminal lugs for either copper or aluminum conductor.
  - E. **ENCLOSURE:** Enclose switch in heavy gauge, welded seam construction, NEMA 1 enclosure.
  - F. **MANUFACTURERS:** Subject to compliance with requirements, provide automatic transfer switches of one of the following:
    1. ASCO, Inc.
    2. Onan Corp.
    3. Russelectric Co.
    4. Zenith Controls, Inc.
    5. Kohler Power System
    6. Generac

## **2.4 ENGINE GENERATOR UNITS:**

- A. Provide 60 hertz alternating-current standby-diesel engine-driven generator units of voltage, phase and capacities indicated. Base rating of electric sets upon operation after deducting power required for output for all necessary operating accessories, (including remote or direct drive radiator fans, fuel pumps, etc.) and under environmental conditions specified. Provide electric sets rated and capable of producing KW specified at 0.8 power factor for continuous standby duty. Certify performance of the electric set series by means of independent testing laboratory tests for full power rating stability, and voltage and frequency regulation.
- B. Provide stationary, water cooled, full diesel, compression ignition, four stroke cycle, multi-cylinder, in-line or V-type engine. Arrange engine for direct connection to an alternator

current generator; do not exceed engine speed of 1800 RPM at full rated load. Completely assemble engine, alternator, and components on a single base before shipping.

- C. **OVERCURRENT PROTECTIVE DEVICES:** Provide overcurrent protective devices mounted in generator enclosure to match ratings of overcurrent protective devices providing service to normal power side of transfer switches.
- D. **LUBRICATION SYSTEM:** Equip engine with a pressure lubricating system. Provide spin-on type full flow lubricating oil filters. Equip filter with bypass valve to insure oil circulation if filters are clogged. Include dipstick oil level indicator. Provide lube oil heater for engine generator units located outdoors or where ambient temperature requires lube oil heating.
- E. **ENGINE COOLING SYSTEM:** Provide engine cooling system that operates fully automatically while the engine is running. The cooling system coolant shall use a combination of water and ethylene-glycol sufficient for freeze protection at the minimum winter outdoor ambient temperature of the application. All coolant pumps shall be centrifugal type. Each engine shall have an engine-driven primary pump.
- F. The engine cooling radiator shall be:
  - 1. Engine/skid mounted at the front of the mounting base. Provide coolant in accordance with manufacturer's recommendation.
- G. Equip engine with thermostatically controlled water jacket heater on all water cooled units. On air-cooled engines provide an oil base heater. The heater voltage shall match available voltage at the site. Make all necessary connections of jacket and oil base heaters.
- H. **AIR CLEANER:** Provide reusable element air cleaner of size and type recommended by the engine manufacturer.
- I. **STARTING:** Equip engine with a 12 volt electric starting motor of sufficient capacity to crank the engine at a speed that will allow full diesel starting of the engine. Disengage starter automatically when engine starts.
- J. Provide engine start-stop switch with functions including reset, run/start, stop and automatic mode. Provide adjustable cycle cranking and cool down operation.
- K. Provide rack mounted lead-acid battery set mounted integrally with electric set base. Provide sufficient capacity for cranking the engine a minimum of 4 cranking periods with 2-minute intervals between cranks. Each cranking period shall have a maximum duration of 15 seconds. Provide capacity and voltage recommended by engine manufacturer. Equip with all necessary interconnecting cables. Provide suitable float type battery charger to maintain the batteries in charged condition.
- L. **BATTERY CHARGER:** Provide suitable automatic SCR voltage regulated battery charger with a maximum charge rate, as recommended by the manufacturer, to maintain batteries at full capacity during standby conditions. Equip with ammeter to indicate charge rate and protect circuit by either fuses or circuit breakers. Design charger such that it will not be damaged during engine cranking.
- M. **ENGINE INSTRUMENTS:** Provide a unit mounted console with the following items:
  - 1. Lubricating oil pressure gauge
  - 2. Lubricating oil temperature display
  - 3. Coolant fluid inlet/outlet temperature display
  - 4. Coolant temperature gauge
  - 5. Run time meter
  - 6. Fuel meter display

7. Tachometer display
  8. Battery charge rate ammeter
  9. Engine Start-stop switch
- N. EXHAUST SYSTEM: Provide a critical type exhaust silencer, flexible exhaust connector, and all exhaust piping and insulation as required. Flexible sections shall be made of convoluted seamless tube without joints or packing. Expansion joints shall be the bellow type. Expansion and flexible elements shall be stainless steel suitable for diesel-engine exhaust gas at 1000 degrees F.
- O. Comply with manufacturer's recommendations. Wrap the entire exhaust system, from manifold to roof or wall penetration with exhaust insulation blankets as manufactured by Advanced Thermal Products, Inc., Santa Ana, California. Install per manufacturer's instructions.
- P. ENGINE PROTECTION DEVICES: Provide the following engine protection devices with indicating light annunciation for each device:
1. Low-oil pressure cut-out
  2. High air temperature cut-out
  3. Overspeed cut-out
- Q. MOUNTING: Equip electric set with a suitable base for mounting on a level surface. Provide vibration isolators, rated for seismic zone specified herein, between the electric set and base. Concrete base shall be designed by a Structural Engineer. All costs arising from design shall be paid by Manufacturer.
- R. FUEL: Provide engine capable of satisfactory performance on commercial grade diesel fuel as recommended by manufacturer.
- S. GOVERNOR: Equip engine with a high performance isochronous electronic governor to maintain frequency within the limits, as specified below by controlling engine and alternator speed.
1. Stability: + or - 0.33 percent at rated load
  2. Speed Regulation: 5 percent maximum load to rated load
- T. The governor shall be configured for safe manual adjustment during operation of the engine-generator from 90 to 110 percent of rated frequency.

## **2.5 FUEL SYSTEM:**

- A. Equip engine with primary and secondary fuel filters with replaceable elements, and an engine driven fuel pump, all mounted on the engine. Provide fuel system piping of size and type recommended by the engine manufacturer. Provide fuel tank(s) as follow(s):
1. Provide fuel tank, sufficient for 24 hours operation at full load, mounted between generator support rails. Provide a secondary containment tank.

## **2.6 ELECTRIC ALTERNATOR:**

- A. Provide direct connected, engine driven, single bearing, synchronous type alternator with electrical characteristics indicated.
- B. INSTANTANEOUS VOLTAGE DIP: Limit voltage dip of engine generator set to less than 30 percent upon application of full rated power. Accomplish voltage regulation by means of a solid state voltage regulator. Inherently regulated machines are acceptable in sizes under 6KW.
- C. Stability: 1 percent of its mean value at any constant load from no load to full load for solid state regulators.

- D. Regulation: Plus or minus 2 percent maximum no load to full load for solid state regulators.
- E. Where more than 40 percent of the load is comprised of rectifiers and/or thyristors, provide power to voltage regulator by means of ceramic type permanent magnet pilot excitor, capable of 80 percent automatic controlled SCR/Thyristor loading.
- F. Provide instrument panel and console with the following:
  - 1. Manual reset circuit breaker
  - 2. A.C. voltmeter
  - 3. A.C. ammeter
  - 4. Voltmeter-ammeter phase selector switch with "off" position
  - 5. Frequency meter
  - 6. Start-Stop switch
  - 7. Remote start terminals
  - 8. Solid state cycle cranking control
  - 9. Engine safety alarm lights and contact
  - 10. Provide automatic solid state overload protection, under frequency protection, and volts/hertz characteristics.

## **2.7 EMERGENCY POWER OFF (EPO):**

- A. The emergency generator shall be provided with a remote EPO (similar to a break glass station) located outside of the room housing the generator.

## **2.8 WEATHERPROOF ENCLOSURE:**

- A. Provide weatherproof enclosure for engine generator unit. Enclosure shall house all components including engine, alternator, batteries, battery charger, fuel tank and controls. Provide one piece roof with drip edge on all four sides and with formed roof stiffeners to support silencer. Provide angle iron frame around the entire bottom of the enclosure to attach to mounting surface. Provide doors on each side for access to engine, alternator and all components. Provide all doors with continuous piano type hinges with stainless steel pins. Provide lockable 2-point latches on all doors, keyed alike. Provide a welded fixed open air intake louver panel on each side to accomplish air intake. Provide a framed expanded metal core guard to accomplish air discharge. Assemble all components with plated bolts and nuts. Caulk all seams to prevent rust bleed through. Clean and paint all components with manufacturer's standard rust inhibiting primer. Provide finish coat paint color to match pad mounted transformer. All openings shall be provided with screen material to exclude entrance of rodents.

## **2.9 SAFETY SYSTEM AND REMOTE ANNUNCIATOR:**

- A. Provide all wiring, devices, equipment, and components to automatically activate the appropriate signals and initiate the appropriate annunciation as specified herein.
- B. Provide remote annunciator panel in flush enclosure (locate as directed by Owner/Architect or as indicated on drawings) with the features specified and with audible and visual alarm indication of the following conditions:
  - 1. Low engine temperature (engine heater not functioning).
  - 2. High temperature prealarm - engine temperature approaching shut down.
  - 3. Low oil pressure prealarm - engine oil pressure approaching shut down.

4. Unit shut down due to low oil pressure.
  5. Unit shut down due to high temperature.
  6. Unit shut down due to overcrank.
  7. Unit shut down due to overspeed.
  8. Emergency (or normal) power source supplying load.
  9. Battery charger malfunction.
  10. Low fuel - main tank contains less than a 3 hour supply.
  11. Low battery voltage.
  12. System ready no alarm conditions present, all controls in "automatic".
  13. Audible alarm silence push button.
- C. MANUFACTURER: Subject to compliance with requirements, provide engine-driven generator sets of one of the following:
1. Caterpillar Tractor Co.
  2. Cummins Engine Co.
  3. Kohler Co.
  4. Generac

### **PART 3 – EXECUTION**

#### **3.1 INSTALLATION OF ENGINE-GENERATOR SYSTEMS:**

- A. Install standby engine-generator sets as indicated, in accordance with the equipment manufacturer's written instructions, and with recognized industry practices, to ensure that engine-generator sets fulfill requirements. Comply with NFPA and NEMA standards pertaining to installation of standby engine-generator systems and accessories.
- B. Provide vibration isolation mounting and anchoring of generator set to concrete slab.
- C. Install fuel oil and piping to standby generator equipment. Comply with manufacturer's instructions and recommendations.
- D. Electrical Identification: Refer to Section 260553 for requirements.

#### **3.2 GROUNDING:**

- A. Provide equipment grounding connections for system components.

#### **3.3 TESTING:**

- A. Upon completion of installation of engine-generator system and after building circuitry has been energized with normal power source, (including all VFD's and other motor starters), test engine-generator to demonstrate standby capability and compliance with requirements. Provide start-up and testing by factory authorized representative in accordance with manufacturer's recommendations. Perform each of the following tests (as a minimum) and submit written report of results of each as part of the Operation and Maintenance Manuals required herein:
  1. Mimic a normal power outage by de-energizing normal power source to the facility. Verify engine start, transfer, and operation of all loads satisfactorily. Re-energize normal power, and verify proper performance of load retransfer, engine cool down, and engine shut down. Record and report all results.

2. Mimic a generator test by operating the “test mode” switch (with facility still energized by normal power). Verify engine start, transfer, and operation of all loads satisfactorily. Return “test” switch to normal, and monitor performance of load retransfer, engine cool down, and engine shut down. Record and report all results.
3. Perform a safety run test in accordance with the following:
  - a. Provide all fluids, equipment, and test instrumentation to perform complete tests.
  - b. Perform and record all engine manufacturer’s recommended pre-starting checks and inspections.
  - c. Verify the proper operation of all controls, gauges, instruments, and set points.
  - d. Verify the proper operation of the emergency stop switch, the over-speed limit switch, oil overfill limit, oil low limit, and the over- and under-frequency limits. Where digital controls prevent direct access to safety switches, the manufacturer’s representative shall utilize a field service computer and manufacturer’s field service software to demonstrate the control’s monitoring of engine speed, oil pressure and coolant temperature.
  - e. Perform an engine load run test. Provide all fluids, equipment, load banks, and test instrumentation to perform complete tests.
4. Perform and record all engine manufacturer’s recommended prestarting checks and inspections.
5. Tests:
  - a. Perform tests recommended by manufacturer and each electrical test and visual and mechanical inspection, except those indicated to be optional, for “AC Generators and for Emergency Systems” specified in NETA acceptance testing specification. Certify compliance with specification parameters.
  - b. Continuous engine load run test:
    - i. Provide a resistance load bank and make temporary connections for full load test.
    - ii. Readings shall be taken at 15 minute intervals shall include the following:
      1. Output amperes, voltage, real and reactive power, power factor and frequency.
      2. Lube-oil pressure.
      3. Coolant, lube-oil, exhaust, and ambient temperatures.
    - iii. Operative the engine generator set for 4 hours at 100% of rated load.
    - iv. Remove load from the engine generator set. Shut down the engine generator set.
6. Perform tests required by NFPA 110 acceptance tests that are additional to those specified here including, but not limited to, a “cold start” test and a one step rated load pickup test. The AHJ (Authority Having Jurisdiction) shall be notified in advance and shall have the option to witness the tests.

7. Inspect lube oil filter for excessive metal, abrasive foreign particles, etc. If corrective action is necessary, perform all above run tests again after corrections have been made. Check all engine and mounting bolts for tightness and/or visible damage. Inspect and verify engine-generator shaft alignment by means of dial indicator.

B. After completion of all tests, provide engine fluid and diesel fuel to refill all engine fluids and refill diesel fuel tank to capacity.

**3.4 SURGE PROTECTIVE DEVICES:**

A. Provide a surge protective device on each switchboard and panelboard located on the emergency distribution system. Refer to section 26 4313 for requirements.

**3.5 ON SITE TRAINING:**

A. Conduct a training course for operating staff as designated by the Owner. The training period shall consist of a total of 8 hours of normal working time distributed between two shifts, and shall start after the system is functionally complete but prior to final acceptance. The course instruction shall cover pertinent points involved in operating, starting, stopping, servicing the equipment as well as all major elements of the operation and maintenance manuals. Additionally, the course instruction shall demonstrate all routine maintenance operations such as oil change, oil filter change, air filter change, etc.

**3.6 FIELD ENGINEER:**

A. Provide a qualified field engineer to supervise the installation of the engine generator set, transfer, etc., assist in the performance of the on-site tests, and instruct personnel as to the operational and maintenance features of the equipment.

**3.7 SERVICE AND SUPPORT**

A. The manufacturer of the generator set shall maintain service parts inventory at a central location that is accessible to the service location 24 hours per day, 365 days per year.

B. The generator set shall be serviced by the local service organization (during the warranty period) that is trained and factory certified in generator set service the supplier shall maintain an inventory of critical replacement parts at the local service organization, and in service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.

**END OF SECTION 26 3213**



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## SECTION 26 3533

### POWER CONDITIONING SYSTEMS

#### PART 1 – GENERAL

##### 1.1 RELATED SECTIONS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

##### 1.2 DESCRIPTION OF WORK

- A. The Contractor shall furnish and install switched harmonic filter equipment as specified herein and as shown on the contract drawings.
- B. This specification contains the minimum requirements for the design, manufacture and testing of switched harmonic filter equipment rated 600 volts and below.
- C. Harmonic filter equipment provided under other sections of the specifications as part of other equipment shall comply with this section of the specifications.
- D. Should the manufacturer or supplier of the equipment specified under this section take exception to any part of this specification, he shall so state in his bid, by reference to each item number.

##### 1.3 REFERENCES

- A. The harmonic filter equipment shall be designed and tested in accordance with the latest standards of NEMA, NEC, IEC, IEEE and ANSI.
- B. The complete equipment including all components used shall be UL listed / recognized and labeled per UL 508, standard for Industrial Control Equipment. Internal capacitor cells are to be UL labeled and in compliance with UL 810, NEMA CP-1 and IEEE 18 and C37 standard.
- C. The equipment shall also be CSA certified.

##### 1.4 SUBMITTALS – FOR REVIEW/APPROVAL

- A. The following information shall be submitted to the Engineer:
  - 1. Master drawing index
  - 2. Front view elevation
  - 3. Floor plan
  - 4. Top view
  - 5. Nameplate schedule
  - 6. Conduit entry/exit locations
  - 7. Equipment ratings including:
    - a. Short-circuit rating
    - b. Voltage
    - c. Continuous current

8. Major component ratings including:
  - a. Voltage
  - b. Continuous current
  - c. Interrupting ratings
9. Cable terminal sizes
10. Product data sheets.

#### **1.5 SUBMITTALS – FOR CONSTRUCTION**

- A. The following information shall be submitted for record purposes:
- B. Final as-built drawings and information for items listed in paragraph 1.04
- C. Certified production test reports
- D. Installation information
- E. The final (as-built) drawings shall include the same drawings as the construction drawings and shall incorporate all changes made during the manufacturing process.

#### **1.6 QUALIFICATIONS**

- A. Manufacturer shall provide recording meter to measure the harmonic spectrum before equipment is ordered.
- B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.
- C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

#### **1.7 REGULATORY REQUIREMENTS**

- A. The harmonic filter equipment and all components therein shall bear a UL label.
- B. Certified copies of production test reports shall be supplied demonstrating compliance with these standards when requested by the Engineer.]

#### **1.8 DELIVERY, STORAGE AND HANDLING**

- A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

#### **1.9 OPERATION AND MAINTENANCE MANUALS**

- A. Equipment operation and maintenance manuals shall be provided with each assembly shipped and shall include instruction leaflets, instruction bulletins and renewal parts lists where applicable, for the complete assembly and each major component.

## **PART 2 – PRODUCTS**

**2.1 MANUFACTURERS:** (The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the Engineer ten (10) days prior to bid date.)

- A. Eaton / Cutler-Hammer
- B. General Electric
- C. ABB

### **2.2 RATINGS**

- A. The system operating voltage shall be as indicated on the contract drawings.
- B. The total capacity of the harmonic filter unit shall be 450 kVAr. The total kVAr capacity shall be divided into 7 kVAr automatically switched in steps of 50 kVAr.
- C. The harmonic filter unit shall be a modular design with provisions for expansion to 450 kVAr
- D. The capacitor shall be rated for operation at ambient temperature ranging from –40 degC to +46 degree C and at 6000 ft. (1800 meters) and below.
- E. Total Harmonic Distortion (THD) of 5% of voltage waveforms shall not affect the life of capacitors, contactors or controller.
- F. A +/- 10% variation in line voltage shall not affect the life of the capacitor.
- G. The filter shall be tuned to the 4.2nd harmonic (252Hz, detuned option)
- H. The capacitor cells shall be harmonically hardened to withstand the dv/dt stresses by harmonic voltage distortions, overrated for higher voltage due to voltage rise by the reactors, continuous over voltage conditions and system voltage variations.

### **2.3 CONSTRUCTION**

- A. Capacitors
  - 1. Individual capacitors shall be three-phase self-healing Metallized polypropylene type capacitors with a low loss design.
  - 2. The high grade vapor deposited AlZn (Aluminum-Zinc) metallization will employ edge enhancement, wavy cut and ramp metallization techniques allowing for higher inrush current capability, stable and uniform capacitance and lower losses and operating temperatures.
  - 3. The Metallized elements shall be impregnated by an inert gas in vacuum to remove all traces of moisture and contaminants and then hermetically sealed to allow excellent capacitor stability and long useful life. The elements shall then be encapsulated in an insulating, high viscosity polyurethane resin compound and then sealed in an aluminum can.
  - 4. The polyurethane resin shall not be a fire hazard, will have a high flash point of 444 deg F or higher and will provide excellent heat dissipation properties while avoiding any partial discharge / corona effects
  - 5. Each capacitor cell shall be furnished with a UL recognized pressure sensitive interrupter. The interrupter shall disconnect all three phases at the same time to maintain a balanced circuit.

6. Capacitors shall be low loss, with a maximum dielectric losses of 0.2W/kVAr and total value less than 0.45 watts per kVAr. . The capacitors shall have integral finger safe terminals with an insulation voltage rating of 3kV AC or higher and be rated for 30 kV BIL impulse strength .
  7. Nominal design life of individual capacitor cells shall be 20 years under rated and defined operating conditions.
  8. Capacitors shall be suitable for a high overcurrent carrying capacity of up to 150% rated current and capable of high inrush current capacity of up to 200 times the nominal current.
  9. Capacitor cells shall be housed in anti-corrosion enclosure such as an extruded Aluminum can and shall be provided with integral grounding stud.
  10. Individual capacitor cells shall be covered by a five-year warranty.
- B. Reactors
1. The reactors shall be tuned to the 4.2nd harmonic order. The reactor shall have copper windings, Class R 220 degrees C insulation system, and be designed with open frame construction.
  2. The copper winding shall be designed for maximum temperature rise of 80 deg C. Thermal protection shall be provided by three normally closed auto reset thermal switches designed to operate at 180 degrees C.
- C. The reactors shall be sized for at least 140% of the nominal current rating of each stage.
- D. Wiring
1. All power wiring shall be 600 volts rated using thermoplastic insulation rated for 105 degrees C temperature rise and sized with ampacity rating at 90 deg C temperature rise.
  2. For floor mounted units, system wiring connections shall be made to copper bus bars braced for 65,000 amps or greater.
  3. Busbars where provided in a system without the integral door interlocked circuit breaker, shall be shielded from direct access by the operator by a barrier sheet and warning labels.
  4. Each assembly shall be furnished with appropriately sized solder less connectors capable of handling conductors in accordance with the NEC. Minimum conductor size shall have the capacity 1.35 times rated capacitor current.
- E. Contactors
1. Contactors shall be capacitor switching duty contactors, rated for switching of rated capacitance by the contactor manufacturer, employing pre-charge module with pre-insertion resistors for damping of capacitor inrush currents
- F. Discharge resistors
1. Capacitors shall be provided with easily mounted push on type premium quality ceramic discharge resistor module that will reduce the residual voltage on the capacitor to less than 50 volts within one minute of de-energization as required by the National Electrical Code Article 460-6. Resistors shall be chosen to ensure a 20 year minimum life.
- G. Fuses
1. In line series fuses on all three phases shall be UL Listed and labeled, and will provide major overcurrent fault protection.
  2. Line fuses shall be current limiting Class T type. Minimum interrupting rating shall be 200,000 amperes at 480 volts for fuses rated 30 amperes and above. Fuses shall be designed for capacitor application and shall be rated not less than 150% filter current rating. G.enclosure
    - a. The switched harmonic filter equipment shall be provided with a floor

mounted enclosure. The enclosure shall be NEMA 1 gasketed fabricated from 12 gauge steel. An internal grounding lug shall be provided. Capacitor cells shall be accessible for visual inspection and replacement from the front of the cabinet without requiring removal of any other parts or components. The enclosure door shall have a three point latch with key locking handle. Removable lifting eyes shall be provided.

- b. The cabinet shall be provided with unidirectional fans for ventilation and cooling. In case of any fixed stages, the fans shall be able to operate continuously without any controller or temperature control.

H. Control power and protection

1. The control power shall be 120V 60Hz AC derived internally in the PFC cabinet.
2. An On/Off switch shall control power to all door mounted controls. The On/Off switch shall contain pilot light to indicate "on" mode.
3. All controls shall be mounted on enclosure door for easy inspection and service.
4. A door interlock shall be provided to disconnect control power when enclosure door is open. A personnel ground fault breaker shall be provided to disconnect control power upon accidental contact with control power and ground.

I. Reactive power controller / power factor meter

1. Controller shall measure the reactive current on every passage of the voltage through zero. B. LED display shall be provided to indicate the stages that are on.
2. The controller shall be provided with a programmable target cosine selector in the range of .7 lagging to .9 leading.
3. The time delay between switching of capacitors must be field programmable and have a range of 5 seconds to 20 minutes to reduce hunting and allow voltage decay as required by NEC.
4. All output contacts shall be disabled within 35 milliseconds of main power interruption. The controller shall retain its programming after the restoration of supply voltage. The controller shall bring the capacitor bank back on line in a step, phased, normal sequence.
5. Controller shall be able to display power factor with indication for an inductive or capacitive power factor.
6. Controller shall have the ability to calculate and store in memory the kVAr value of each step.
7. Controller shall recognize a defective capacitance step and eliminate that step from the circuit.
8. Controller shall automatically determine C/K ratio.\Controller shall indicate insufficient kVAr to achieve target power factor.
9. Controller shall provide a remote connection to a PC or printer.
10. Controller shall provide an option for metering options and displaying various capacitor parameters such as measuring voltage (V), current of sensed phase (I), Power factor (pf), Reactive power (kVAr), Active Power (kW), Apparent power (kVA), frequency (f).\Controller shall provide an option for fan control.
11. Controller shall provide an option for supervisory monitoring functions such as undervoltage, overvoltage, harmonics, loss of power and number of operations, RS485 with Modbus RTU protocol.

## 2.4 BLOWN FUSE LIGHTS

- A. Blown Fuse indication shall be provided on the door to facilitate identification of a failed fuse.
- B. On a wall mounted unit, each capacitor fuse will be provided with its own blown fuse indicating light mounted in close proximity to the fuse for easy identification.

- C. For floor mounted units, three "Push-To-Test" door mounted blown fuse pilot lights, one per phase shall be provided, , to indicate a blown fuse condition in addition to the internal individual blown fuse lights beside the fuses.

**2.5 NAMEPLATES**

- A. Each unit will have a 1.0 x 2.5-inch nameplate. The lettering shall be black 3/16-inch high, on a grey background.

**2.6 FINISH**

- A. Harmonic filter equipment enclosures shall be provided with a baked enamel finish. Exterior color shall be ANSI 61. The complete equipment will come pre-wired and factory assembled. All wiring connections shall be mechanically secured to the specified torque values before shipment.
- B. The entire equipment shall be warranted by the manufacturer for one year of operation or 18 months after shipment whichever is sooner.

**2.7 SYSTEM COMPATIBILITY**

- A. A system compatibility analysis shall be considered by the automatic capacitor bank manufacturer. It will be the responsibility of the contractor to provide the manufacturer, at the time of request for quote, the data covered listed below
- B. This analysis shall be done to identify any potential or existing harmonics current sources. The data will be used to determine if the capacitor bank can be installed without the addition of chokes or filters.

- 1. Total kVAr to be added  \_\_\_\_\_ kVAr
- 2. kVAr currently on the system  \_\_\_\_\_ kVAr
- 3. Main transformer impedance  \_\_\_\_\_ %;  \_\_\_\_\_ KVA
- 4. Primary transformer voltage  \_\_\_\_\_ VOLTS
- 5. Secondary transformer voltage  \_\_\_\_\_ VOLTS
- 6. Nominal load information:  \_\_\_\_\_ KW,  \_\_\_\_\_ KVA,  
 \_\_\_\_\_ POWER FACTOR
- 7. Desired power factor  \_\_\_\_\_ %
- 8. The following list summarizes major non-linear loads (in HP). List major non-linear loads for the facility.

**PART 3 – EXECUTION**

**3.1 FACTORY TESTING**

- A. All capacitors shall be tested in compliance with NEMA, ANSI, UL and CSA requirements for capacitance, dissipation factor, terminal to terminal and terminal to case dielectric strength, and oil leaks. All capacitor cells shall be traceable through construction and testing.
- B. The automatic power factor capacitor correction unit shall be tested for proper operation prior to leaving the factory. The following checks, measurements, and operations must be confirmed and recorded for each stage. The certified record of these tests shall become part of the permanent documentation package that travels with the automatic capacitor bank.
  - 1. Wire connections
  - 2. Torque connections

3. Phase to Phase resistance checks
4. Phase to Phase capacitance checks
5. Controller operation, manual operation
6. Controller operation, automatic operation

### **3.2 EXAMINATION**

- A. Installing Contractor to fully inspect shipments for damage and report damage to manufacturer and file claim upon shipper, if necessary.
- B. Installing Contractor to verify NEC clearances as dictated on the contract drawings prior to installation. Verify UL labeling of the assembly prior to installation.

### **3.3 INSTALLATION**

- A. The Contractor shall follow the installation instructions supplied by the manufacturer.

### **3.4 VERIFICATION**

- A. The Contractor shall verify that the power factor correction setting is placed at or near 0.95 power factor. If 0.95 power factor is not met, contractor is responsible to work with manufacturer to modify settings.

**END OF SECTION 26 3533**



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## SECTION 26 4313

### SURGE PROTECTIVE DEVICES (SPD)

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division 26 Basic Materials and Methods sections apply to work specified in this section.

##### 1.2 DESCRIPTION OF WORK:

- A. Extent of SPD's work is indicated by drawings, schedules and specified herein. Work includes complete installation, electrical connections, testing, and commissioning.

##### 1.3 QUALITY ASSURANCE:

- A. Comply with NEC, NEMA and IEEE Standards as applicable to wiring methods, construction and installation of SPD's. Comply with applicable requirements of ANSI/IEEE C62.11, C62.41.2 and C62.45; NFPA 70 285 (Type 2), 75, and 78; and ANSI/UL 1449 4<sup>th</sup> edition. Provide complete packaged units that have been listed and labeled by Underwriters Laboratory. UL surge ratings (UL 1449) must be permanently affixed to the SPD's device.

##### 1.4 SUBMITTALS:

- A. Refer to Section 260502 for electrical submittal requirements.

#### PART 2 - PRODUCTS:

##### 2.1 ACCEPTABLE MANUFACTURERS:

- A. Subject to compliance with requirements, provide products manufactured by one of the following as indicated by "Location Category" herein.
  - 1. Advanced Protection Technologies Inc.
  - 2. Current Technology Inc.
  - 3. Cutler Hammer, Inc.
  - 4. L.E.A. International
  - 5. Emerson Network Power Surge Protection Inc.
  - 6. United Power Corporation
  - 7. GE
  - 8. Eaton
  - 9. Surgellogic (Square D)

##### 2.2 GENERAL:

- A. Except as otherwise indicated, provide high energy surge protective devices, with high frequency line noise filtering, suitable for application in Category A, B, and C environments as indicated. Provide types, sizes, ratings and electrical characteristics

indicated that comply with manufacturer's standard materials, design, and construction in accordance with published information and as required for a complete installation.

B. Provide externally mounted SPD units only.

**2.3 VOLTAGE SURGE SUPPRESSION – GENERAL:**

A. Electrical Requirements

1. Unit Operating Voltage – Refer to drawings for operating voltage and unit configuration.
2. Maximum Continuous Operating Voltage (MCOV) – The MCOV shall not be less than 115% of the nominal system operating voltage.
3. The suppression system shall incorporate thermally protected metal-oxide varistors (MOVs) as the core surge suppression component for the service entrance and all other distribution levels. The system shall not utilize silicon avalanche diodes, selenium cells, air gaps, or other components that may crowbar the system voltage leading to system upset or create any environmental hazards.
4. Protection Modes – The SPD must protect all modes of the electrical system being utilized. The required protection modes are indicated by bullets in the following table:

| Configuration      | Protection Modes |     |     |     |
|--------------------|------------------|-----|-----|-----|
|                    | L-N              | L-G | L-L | N-G |
| Wye                | •                | •   | •   | •   |
| Delta              | N/A              | •   | •   | N/A |
| Single Split Phase | •                | •   | •   | •   |
| High Leg Delta     | •                | •   | •   | •   |

5. Nominal Discharge Current (In) – All SPDs applied to the distribution system shall have a 20kA In rating regardless of their SPD Type (includes Types 1 and 2) or operating voltage. SPDs having an In less than 20kA shall be rejected.
6. ANSI/UL 1449 4<sup>th</sup> Edition Voltage Protection Rating (VPR) – The maximum ANSI/UL 1449 4<sup>th</sup> Edition VPR for the device shall not exceed the following:

B. SPD Design

1. Maintenance Free Design – The SPD shall be maintenance free and shall not require any user intervention throughout its life. SPDs containing items such as replaceable modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.
2. Balanced Suppression Platform – The surge current shall be equally distributed to all MOV components to ensure equal stressing and maximum performance. The surge suppression platform must provide equal impedance paths to each matched MOV. Designs incorporating replaceable SPD modules shall not be accepted.
3. Electrical Noise Filter – Each unit shall include a high-performance EMI/RFI noise rejection filter. Noise attenuation for electric line noise shall be up to 50 dB from 10 kHz to 100 MHz using the MIL-STD-220A insertion loss test method.

Products unable able to meet this specification shall not be accepted.

4. Internal Connections – No plug-in component modules or printed circuit boards shall be used as surge current conductors. All internal components shall be soldered, hardwired with connections utilizing low impedance conductors.
5. Monitoring Diagnostics – Each SPD shall provide the following integral monitoring options:
  - a. Protection Status Indicators - Each unit shall have a green / red solid-state indicator light that reports the status of the protection on each phase.
    - i. For wye configured units, the indicator lights must report the status of all protection elements and circuitry in the L-N and L-G modes. Wye configured units shall also contain an additional green / red solid-state indicator light that reports the status of the protection elements and circuitry in the N-G mode. SPDs that indicate only the status of the L-N and L-G modes shall not be accepted.
    - ii. For delta configured units, the indicator lights must report the status of all protection elements and circuitry in the L-G and L-L modes.
    - iii. The absence of a green light and the presence of a red light shall indicate that damage has occurred on the respective phase or mode. All protection status indicators must indicate the actual status of the protection on each phase or mode. If power is removed from any one phase, the indicator lights must continue to indicate the status of the protection on all other phases and protection modes. Diagnostics packages that simply indicate whether power is present on a particular phase shall not be accepted.
  - b. Remote Status Monitor – The SPD must include Form C dry contacts (one NO and one NC) for remote annunciation of its status. Both the NO and NC contacts shall change state under any fault condition.
  - c. Audible Alarm and Silence Button – The SPD shall contain an audible alarm that will be activated under any fault condition. There shall also be an audible alarm silence button used to silence the audible alarm after it has been activated.
  - d. Surge Counter – The SPD shall be equipped with an LCD display that indicates to the user how many surges have occurred at the location. The surge counter shall trigger each time a surge event with a peak current magnitude of a minimum of  $50 \pm 20A$  occurs. A reset pushbutton shall also be standard, allowing the surge counter to be zeroed. The reset button shall contain a mechanism to prevent accidental resetting of the counter via a single, short-duration button press. In order to prevent accidental resetting, the surge counter reset button shall be depressed for a minimum of 2 seconds in order to clear the surge count total.
    - i. The ongoing surge count shall be stored in non-volatile memory. If power to the SPD is completely interrupted,

the ongoing count indicated on the surge counter's display prior to the interruption shall be stored in non-volatile memory and displayed after power is restored. The surge counter's memory shall not require a backup battery in order to achieve this functionality.

6. Overcurrent Protection
  - a. The unit shall contain thermally protected MOVs. These thermally protected MOVs shall have a thermal protection element packaged together with the MOV in order to achieve overcurrent protection of the MOV. The thermal protection element shall disconnect the MOV(s) from the system in a fail-safe manner should a condition occur that would cause them to enter a thermal runaway condition.
7. Fully Integrated Component Design – All of the SPD's components and diagnostics shall be contained within one discrete assembly. SPDs or individual SPD modules that must be ganged together in order to achieve higher surge current ratings or other functionality shall not be accepted.
8. Safety Requirements
  - a. The SPD shall minimize potential arc flash hazards by containing no user serviceable / replaceable parts and shall be maintenance free. SPDs containing items such as replaceable modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.
  - b. SPDs designed to interface with the electrical assembly via conductors shall require no user contact with the inside of the unit. Such units shall have any required conductors be factory installed.
  - c. Sidemount SPDs shall be factory sealed in order to prevent access to the inside of the unit. Sidemount SPDs shall have factory installed phase, neutral, ground and remote status contact conductors factory installed and shall have a pigtail of conductors protruding outside of the enclosure for field installation.

## 2.4 SYSTEM APPLICATION

- A. The SPD applications covered under this section include distribution and branch panel locations, busway, motor control centers (MCC), switchgear, and switchboard assemblies. All SPDs shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category C, B, and A environments.
- B. Provide a surge protective device on each switchboard and panelboard located on the emergency distribution system. Refer to table below for category type.

| Minimum surge current capacity based on ANSI / IEEE C62.41 location category |  |           |          |
|--|--|-----------|----------|
| CATEGORY   | Application  | Per Phase | Per Mode |
| C  | Service Entrance Locations<br>(Switchboards, Switchgear, MCC, Main Entrance) | 250 kA    | 125 kA   |
| B  | High Exposure Roof Top Locations<br>(Distribution Panelboards)               | 160 kA    | 80 kA    |
| A  | Branch Locations (Panelboards, MCCs, Busway)                                 | 120 kA    | 60 kA    |

- C. Surge Current Capacity – The minimum surge current capacity the device is capable of withstanding shall be as shown in the following table:
- D. SPD Type – all SPDs installed on the line side of the service entrance disconnect shall be Type 1 SPDs. All SPDs installed on the load side of the service entrance disconnect shall be Type 1 or Type 2 SPDs.

## **2.5 LIGHTING AND DISTRIBUTION PANELBOARD REQUIREMENTS**

- A. The SPD application covered under this section includes lighting and distribution panelboards. The SPD units shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category B environments.
  - 1. The SPD shall not limit the use of through-feed lugs, sub-feed lugs, and sub-feed breaker options.
  - 2. SPDs shall be installed following the load side of the main breaker. SPDs installed in main lug only panelboards shall be installed immediately following the incoming main lugs.
  - 3. The panelboard shall be capable of re-energizing upon removal of the SPD.
  - 4. The SPD shall be interfaced to the panelboard via a direct bus bar connection. Alternately, an SPD connected to a 30A circuit breaker for disconnecting purposes may be installed using short lengths of conductors as long as the conductors originate integrally to the SPD. The SPD shall be located directly adjacent to the 30A circuit breaker.
  - 5. The SPD shall be included and mounted external of the panelboard.
  - 6. The SPD shall be of the same manufacturer as the panelboard.
  - 7. The complete panelboard including the SPD shall be UL67 listed.
- B. Sidemount Mounting Applications Installation (SPD mounted external to electrical assembly)
  - 1. Lead length between the breaker and suppressor shall be kept as short as possible to ensure optimum performance. Any excess conductor length shall be trimmed in order to minimize let-through voltage. The installer shall comply with the manufacturer's recommended installation and wiring practices.
- C. Switchgear, Switchboard, MCC and Busway Requirements
  - 1. The SPD application covered under this section is for switchgear, switchboard, MCC, and busway locations. Service entrance located SPDs shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category C environments.
  - 2. The SPD shall be of the same manufacturer as the switchgear, switchboard, MCC, and busway
  - 3. The SPD shall be factory installed outside the switchgear, switchboard, MCC, and/or bus plug at the assembly point by the original equipment manufacturer
  - 4. Locate the SPD on the load side of the main disconnect device, as close as possible to the phase conductors and the ground/neutral bar.
  - 5. The SPD shall be connected through a disconnect (30A circuit breaker). The disconnect shall be located in immediate proximity to the SPD. Connection shall be made via bus, conductors, or other connections originating in the SPD and shall be kept as short as possible.
  - 6. The SPD shall be external to switchgear, switchboard, MCC, and/or bus plug as

a factory standardized design.

7. All monitoring and diagnostic features shall be visible from the front of the equipment.

## **2.6 ENCLOSURES**

- A. All enclosed equipment shall have NEMA 1 general purpose enclosures, unless otherwise noted. Provide enclosures suitable for locations as indicated on the drawings and as described below:
  1. NEMA 1 – Constructed of a polymer (units integrated within electrical assemblies) or steel (sidemount units only), intended for indoor use to provide a degree of protection to personal access to hazardous parts and provide a degree of protection against the ingress of solid foreign objects (falling dirt).
  2. NEMA 4 – Constructed of steel intended for either indoor or outdoor use to provide a degree of protection against access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (dirt and windblown dust); to provide a degree of protection with respect to the harmful effects on the equipment due to the ingress of water (rain, sleet, snow, splashing water, and hose directed water); and that will be undamaged by the external formation of ice on the enclosure. (sidemount units only)
  3. NEMA 4X – Constructed of stainless steel providing the same level of protection as the NEMA 4 enclosure with the addition of corrosion protection. (sidemount units only)

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install SPD's as indicated in accordance with manufacturers recommendations and as necessary to meet requirements. Install with conductors of minimum length practicable, but in no case exceeding 30" in length; minimum conductor size - #6 AWG copper.
- B. Install conductors in straight runs with a minimum of turns or bends (minimum bend radius to be 90 degrees). Do not splice phase or ground conductors in SPD's circuit. Torque all conductor terminations in accordance with manufacturer's recommendations.

### **3.2 FIELD QUALITY CONTROL:**

- A. Upon completion of installation of equipment, energize and demonstrate capability and compliance with requirements. Remove malfunctioning units, replace with new units and proceed with retesting.

**END OF SECTION 26 4313**

## SECTION 26 5100

### INTERIOR AND EXTERIOR BUILDING LIGHTING

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26 Basic Materials and Methods sections apply to work specified in this section.

##### 1.2 DESCRIPTION OF WORK:

- A. Types of lighting fixtures in this section are indicated by schedule and include the following:
  - 1. LED (Light Emitting Diode)

##### 1.3 QUALITY ASSURANCE:

- A. Comply with NEC, NEMA and ANSI 132,1 as applicable to installation and construction of lighting fixtures. Provide lighting fixtures that have been UL-listed and labeled.
- B. Components and fixtures shall be listed and approved for the intended use by a National Recognized Testing Laboratory (NRTL) including: UL, ETL, and CSA or equivalent
- C. All led products shall comply with the latest version of Illuminating Engineer Society (IES) publications LM-79 and LM-80.

##### 1.4 SUBMITTALS:

- A. Refer to Section 260502 for electrical submittal requirements.

#### PART 2 – PRODUCTS

##### 2.1 ACCEPTABLE MANUFACTURERS:

- A. Subject to compliance with requirements, provide products of one of the following (for each type of fixture):
  - 1. LED:
    - a. Cree
    - b. Nichia
    - c. Samsung
    - d. Philips Lumiled
    - e. Osram
    - f. Xicato

##### 2.2 INTERIOR AND EXTERIOR LIGHTING FIXTURES:

- A. GENERAL:
  - 1. Provide lighting fixtures, of sizes, types and ratings indicated complete with, but not necessarily limited to, housings, lamps, lamp holders, reflectors, ballasts, LED drivers, starters, and wiring. Label each fixture with manufacturer's name



and catalog number. Provide all enclosed fixtures with positive latch mechanisms; spring tension clips not acceptable. Provide all exterior fixtures with damp or wet location label as required by application.

**B. SUPPORT REQUIREMENTS:**

1. Provide all pendant and stem hung fixtures with flexible ball joint hangers at all points of support. Equip hooks used to hang fixtures with safety latches. Provide all detachable fixture parts, luminous ceiling accessories, louvers, diffusers, lenses, and reflectors with locking catches, screws, safety chain, or safety cable.

**C. LIGHT EMITTING DIODE (LED) LUMINAIRES:**

1. LED luminaires that can be serviced in place shall have a disconnecting means internal to the luminaires to disconnect simultaneously from the source of supply all conductors of the driver, including the grounded conductor. Disconnects shall not be required under the following exceptions:
  - a. Luminaires located in hazardous locations.
  - b. Luminaires used for egress lighting.
  - c. Cord-and-plug luminaires.
  - d. In industrial establishments with restricted public access where conditions of maintenance and supervision ensure that only qualified persons service the installation.
  - e. Where more than one luminaire is installed in a space and where disconnecting the supply conductors to the luminaire will not leave the space in total darkness.
  - f. Provide LED luminaires which are tested in accordance with IES LM-79, diodes tested in accordance with IES LM-80, and provide a minimum R9 rating of  $\geq 50$  (unless specified differently), a CRI rating of  $\geq 80$  and L70 (6K) = 50,000 hours (IES TM-21). Provide with 0-10V dimming drivers as standard.
  - g. The fixture manufacturer(s) shall warrant the luminaires, in their entirety, to be free from defects in material or workmanship for at least 5 years from date of manufacture. Provide warranty in accordance with other sections of this specification and include a certificate of warranty from the fixture manufacturer with extended warranty information and proper forms and procedure description.

**D. DIFFUSERS:**

1. Where plastic diffusers are specified, provide 100 percent virgin acrylic compound; minimum thickness, .125 inches.

**E. ACOUSTICAL CEILING BAFFLES (LIT & UNLIT):**

1. LIT Version:
  - a. Modular LED tray assembly comprising reflector and light engine with quick disconnect wire-harness for ease of installation and maintenance over the life of the luminaire.
  - b. Offered with our next generation Neo-Ray light engine delivering industry leading efficacy and long-life
  - c. 0-10V Dimming Driver
2. Surface Texture: Medium.

3. Composition: Polyester (PET) felt.
4. Color: Custom and as selected by architect from full-range of wood-inspired textures.
5. Size: 3" X 8" (lengths per plan)
  - a. See Architectural for UNLIT Baffles
  - b. See Electrical for LIT Baffles
6. Spacing 12" O.C.
  - a. Suspended from ceiling and/or deck. Match architectural details for suspension heights.
7. Connection: Feltlock connection to Unistrut -P1000 series.
8. Basis-of-Design-Product Product: "Define LED Acoustic Luminaire", as manufactured by Neo-Ray

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION OF LIGHTING FIXTURES**

- A. Install lighting fixtures at locations and heights as indicated, in accordance with fixture manufacturer's written instructions, applicable requirements of NEC, NECA's "Standards of Installation", NEMA standards, and with recognized industry practices to ensure that lighting fixtures fulfill requirements.
- B. Coordinate with other work as appropriate to properly interface installation of lighting fixtures with other work. Consult architectural reflected ceiling plan for exact location of all lighting fixtures.
- C. Provide all necessary supports, brackets, and miscellaneous equipment for mounting of fixtures. Support all ceiling mounted fixtures from the building structure; independent of the ceiling system, unless noted. Support each recessed fixture (fluorescent incandescent, and/or HID) from the building structure with #12 ga. steel wire attached to each corner (in addition to supports normally provided for attachment to the ceiling system). Provide backing supports above (or behind) sheetrock, plaster and similar ceiling and wall materials. Support surface mounted ceiling fixtures from channel. Support ceiling mounted outlet boxes independent of the raceway system, and capable of supporting 200 pounds. Feed each recessed fixture directly from an outlet box with flex conduit as required; do not loop from fixture to fixture. See plans for additional details.
- D. FIXTURE WHIPS:
  1. Provide each lay-in light fixture with at least 36" (Not to exceed 72") of 3/8" steel flexible conduit.
  2. With-in spaces utilizing 0-10v control schemes ie: Room Controllers, the fixture whip shall be comprised of a MC-PCS Cable (see Section 26 0532 Conduit raceways) with at least 36" and not to exceed 72" in length located above removable grid ceilings.
- E. Coordinate lighting in mechanical room with duct and equipment locations to avoid obstruction of illumination.
- F. Provide gypsum board protection as required, (acceptable to fire official having jurisdiction) to ensure fire rating of each ceiling that the fixtures are installed in.
- G. COORDINATION MEETINGS:
  1. Meet at least twice with the architect and ceiling installer. Hold first meeting before submittal of shop drawings to coordinate each light fixture mounting

condition with ceiling type. During second meeting, coordinate fixture layout in each area.

- a. Coordinate mounting height of pendant and wall mounted fixtures.
- b. Coordinate conduit layout in all open ceiling spaces e.g. Gym, Commons, Auditorium, etc. with architect prior to rough-in.

2. Meet at least twice with the AV/Intercom systems Installer. Hold first meeting before submittal of shop drawings to coordinate each AV equipment, speaker mounting condition with ceiling type. During second meeting, coordinate AV equipment, speaker layout in each area.

3. Meet at least once with the mechanical installer prior to fabrication and installation of duct work. Coordinate depth and location of all fixtures and duct work in all areas.

H. ADJUST AND CLEAN:

1. Clean lighting fixtures of dirt and debris upon completion of installation.
2. Protect installed fixtures from damage during remainder of construction period. Repair all nicks and scratches to appearance of original finish.

**3.2 FIELD QUALITY CONTROL:**

A. Upon completion of installation of lighting fixtures, and after building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements.

B. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise remove and replace with new units, and proceed with retesting.

C. At the time of Substantial Completion, replace lamps in interior lighting fixtures that are observed to be noticeably dimmed after the Contractor's use and testing, as judged by Architect/Engineer.

D. GROUNDING:

1. Provide equipment grounding connections for each lighting fixture.

**END OF SECTION 26 5100**

## SECTION 26 5600

### EXTERIOR AREA LIGHTING

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26 Basic Materials and Methods sections apply to work specified in this section.

##### 1.2 DESCRIPTION OF WORK:

- A. Types of lighting fixtures in this section are indicated by schedule and include the following:
  - 1. LED (Light Emitting Diode)
- B. Excavation and backfilling for exterior area lighting poles, standards and foundations are specified in applicable Division-26 general provision sections.
- C. Concrete for embedding poles, and for pole foundations and footings is specified in other sections of specification. Provide pole bases under this section of the specification.
- D. Refer to other Division-26 sections for cable, wire and connectors required in connection with exterior area lighting poles and standards.

##### 1.3 QUALITY ASSURANCE:

- A. Comply with NEC, NEMA and ANSI/IES requirements as applicable to location and installation of lighting poles and standards. Provide lighting components and fittings that are UL-listed and labeled.
- B. Comply with other portions of specification as applicable for forming, splicing, and curing of concrete bases provided under this section.

##### 1.4 SUBMITTALS:

- A. Refer to Section 260502 for electrical submittal requirements.

#### PART 2 - PRODUCTS

##### 2.1 MANUFACTURER: Subject to compliance with requirements, provide products as scheduled on drawings.

- A. CONCRETE: 3000 psi Class.
- B. LIGHT FIXTURE POLES: Provide light fixture poles that comply with the following minimum requirements.
  - 1. The pole shaft constructed of seamless aluminum alloy per requirements of ASTM B221. Include a flush covered hand hole in each pole with finish hardware. Provide a permanent marking with the manufacturer name inside the hand hole for easy recognition.
  - 2. Provide aluminum alloy anchor base welded to the pole shaft. Welding must comply with AWS Specification D1.2, Structural Welding Code – Aluminum. The complete assembly must be heat-treated to a T6 temper.

3. Provide super durable thermosetting polyester power coat paint, a minimum of 1.5 mils thick along the entire length of the pole.
4. Include aluminum nut covers for a "Shoe Base" trim.
5. Provide a 10 year minimum guarantee, which covers the pole structure and paint.
6. Provide vibration dampening in poles.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION:**

- A. Install area lighting units as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC, NESC and NEMA standards and with recognized industry practices to ensure that lighting units fulfill requirements.
- B. Coordinate with other work as necessary to properly interface installation of roadway and parking area lighting with other work.
- C. Comply with NEC 300-5 (or State of Utah requirement, whichever is most stringent), for raceway burial depth.
- D. Mount lighting units on concrete bases as indicated, complete with anchor bolts and reinforcing bars. Coordinate proper size and location of all bases as required to ensure proper installation. Provide 3000 psi class concrete; hand rub all exposed concrete to uniform, smooth finish.
- E. Deliver poles to job site with factory finish paint.
- F. Set poles and standards plumb. Support adequately during backfilling, or anchoring to foundations.
- G. Provide sufficient space encompassing hand access and cable entrance holes for installation of underground cabling.

#### **3.2 GROUNDING:**

- A. Provide equipment grounding connections for each lighting unit installation.

**END OF SECTION 26 5600**

## SECTION 26 9000

### SYSTEMS COMMISSIONING

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Architectural, Structural, Mechanical and other applicable documents are considered a part of the electrical documents insofar as they apply as if referred to in full.
- C. Refer specifically to Section 01810 and Section 01815 for responsibilities to aid a commissioning agent.

##### 1.2 DESCRIPTION OF WORK:

- A. System commissioning is not part of division 26, however will take place during construction. Division 26 contractor will be required to assist the commissioning agent with access to shop drawings and to various equipment required to be commissioned.
- B. The systems requiring commissioning are:
  - 1. Lighting Controls:
    - a. Lighting Control Equipment, Section 26 0943
    - b. Occupancy Lighting Control, Section 26 0923
  - 2. Emergency Electrical System, Section 26 3213
  - 3. Telephone/Data Specification, Section 27 1500
  - 4. Audiovisual Systems, Section 27 4100
  - 5. Intercommunications Systems, Section 27 5123
  - 6. Security Systems
    - a. Intrusion Detection, Section 28 1600
    - b. Access Control, Section 28 2205
    - c. Video Surveillance, Section 28 2301
  - 7. Fire Alarm and Detection System, Section 28 3111

**PART 2 – PRODUCTS: Not Used**

**PART 3 – EXECUTION: Not Used**

**END OF SECTION 26 9000**

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## **DIVISION 27 - COMMUNICATIONS**

Section 27 1500

Section 27 4100

Section 27 5123

Section 27 5320

Audiovisual Systems

Audiovisual Systems

Intercommunications Systems

Public Safety DAS/ERRCS



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## SECTION 27 1500

### TELEPHONE/DATA SYSTEMS

#### PART 1 – GENERAL

##### 1.1 SCOPE OF DOCUMENT:

- A. The following are project specifications that all cabling systems must adhere to. These specifications apply to all installers (hereinafter referred to as “the Contractor”) for all sites, that require, standards-compliant structured cabling systems and shall be used for all the installation, testing, and acceptance of the information transport systems as described in the attached specifications. Prices quoted of the installation facilities shall be all-inclusive and represent a complete installation at such sites as prescribed in this specification and contract documents. The Contractor shall be solely responsible for all parts, labor, testing, acceptance and all other associated processes and physical apparatus necessary to turn-over a completed system fully warranted and operational for acceptance by the Customer. Final acceptance of the installation shall be in writing by the Architect and Engineer.
- B. In all instances where Standards are cited, it is assumed Installer will have familiarity with and implicitly follow the recommendations of the most current version of the Standard referenced at the time of installation. Compliance with most current Standards is the sole responsibility of the Contractor.

##### 1.2 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-7 Firestopping, apply to work of this section.
- C. Division-26 Basic Materials and Methods sections apply to work specified in this section.
- D. Refer to and coordinate with specification 27 4100 for any audiovisual equipment requiring UTP based category and/or optical fiber cabling and connectivity. Division 27 1500 shall provide installation and execution requirements for all category and/or optical fiber cabling and connectivity required within the audiovisual system

##### 1.3 SCOPE OF WORK:

- A. The extent of telephone/data system work is indicated by drawings and is hereby defined to include, but not be limited to racks, cabinets, patch panels, cables, raceway, outlet boxes, device plates, backboard, and grounding. Contractor is responsible for installation of all specified and unspecified necessary and miscellaneous items required for delivery of a complete and functional data cabling and device system.
- B. Contractor shall provide complete cable and outlet system as indicated on the drawings and described herein. Work shall include all associated infrastructure transmission components and support appliances including, but not be limited to cable, jacks, terminal blocks, racks, cabinets, wire management, labeling, transient voltage surge suppression, patch cords, telecommunications grounding system and all terminations as specified herein.
- C. Contractor shall provide system testing as described herein using up-to-date and industry accepted Level IIIe, IV, V test equipment appropriate to the types of links being tested and in accordance with the latest edition of IEC 61935-1. All testers used shall be factory calibrated within one year of use with references set daily prior to testing.
- D. All active equipment (electronics) will be owner furnished and owner installed.
- E. Contractor shall be solely responsible for all parts, labor, testing, documentation and all

other associated processes and physical apparatus necessary to turn-over the completed system fully warranted and operational for acceptance by Owner and Engineer.

- F. Contractor shall provide all labor, materials, tools and equipment required for the complete installation of work called for in the Construction Documents.
- G. Copper solution must match optical fiber solution and be provided by the same manufacturer. No two separate warranties are acceptable for the copper connectivity and optical fiber connectivity.
- H. Contractor shall provide 1-1" EMT conduit from telecommunications outlet/connector to accessible ceiling space, then utilize non-continuous cable support devices to cable tray.

#### 1.4 CONTRACTOR QUALIFICATIONS

- A. The contractor shall be fully conversant and capable in the cabling of low voltage applications such as, but not limited to voice and data network systems. The Contractor shall at a minimum possess the following qualifications:
  - 1. Must have at a minimum (1) RCDD certified individual employed full time at the time of bidding and throughout entire project. **PROVIDE PROOF OF RCDD CERTIFICATION IMMEDIATELY UPON JOB AWARD.**
  - 2. Approved and certified by connectivity manufacturer. Provide proof of certification immediately upon job award.
  - 3. BICSI Certified Installers or equivalent.
  - 4. Possess those licenses/permits required to perform telecommunications installations in the specified jurisdiction.
  - 5. Have a minimum of 5 years in the communications structured cabling business and be able to provide three owner references for the type of installation described in this specification for projects within the last 18 months.
  - 6. Personnel trained and certified in fiber optic cabling, splicing, termination and testing techniques. Personnel must own not rent a light meter or fiber test adapter head, and OTDR and shall be factory certified by the manufacturer of the products being installed.
  - 7. Personnel trained in the installation of pathways and support for housing horizontal and backbone cabling.
  - 8. Personnel knowledgeable in local, state, province and national codes, and regulations. All work shall comply with the latest revision of the codes or regulations. When conflict exists between local or national codes or regulations, the most stringent codes or regulations shall be followed.
  - 9. Be factory certified by the manufacturer used in installation of all transmission components of all copper and fiber links and able to provide the manufacturer warranty.

#### 1.5 QUALITY ASSURANCE

- A. Required Pre-Telecommunications Construction Meeting with Communications Engineer: Electrical contractor/representative AND Communications Contractor will be required to attend a pre-communications construction meeting (approximately 30-60 minutes) with Communications representative in the electrical engineer's office prior to communications construction commencement. This meeting will address any questions on the part of the contractor and the expectations of the Engineer with regard to specifications, plans and site visits for both rough and finish electrical work.
- B. Owner IT Contact:
  - 1. **Cameron Chugg; [chuggc@ogdensd.org](mailto:chuggc@ogdensd.org), 801-737-8827**
- C. BNA IT Contact:

1. **Eric Skinkis;eskinkis@bnaconsulting.com, 801-532-2196**
2. **Drayton Bailey; [drayton@bnaconsulting.com](mailto:drayton@bnaconsulting.com), 801-532-2196**

## **1.6 APPLICABLE CODES AND STANDARDS**

- A. Contractor is responsible for compliance with all applicable portions of the NEC code as to type of products used and installation of components. All materials used shall be products and materials that have been UL-listed and labeled. All installed products shall comply with applicable NEMA standards for low loss extended frequency cable.
- B. In addition, installation shall adhere to the following Standards:
  1. ANSI/TIA-568-C.0 - Generic Telecommunications Cabling for Customer Premises, or most recent edition at the time of installation
  2. ANSI/TIA-568-C.1 – Commercial Building Telecommunications Cabling Standards, or most recent edition at the time of installation
  3. ANSI/TIA-568-C.2 - Balance Twisted Pair Communications and Components Standards, or most recent edition at the time of installation
  4. ANSI/TIA –942 -Telecommunications Infrastructure for Data Centers, or most recent edition at the time of installation
  5. TIA-569-B - Commercial Building Standard for Telecom Pathways and Spaces, or most recent edition at the time of installation
  6. ANSI/TIA-606-A – Administration Standard for the Telecommunications Infrastructure of Commercial Buildings, or most recent edition at the time of installation
  7. ANSI/NECA/BICSI-607 - Commercial Building Grounding/Bonding Requirements, or most recent edition at the time of installation
  8. ANSI/TIA 1152 – Testing of Copper Links
  9. BICSI Telecommunications Distribution Methods Manual, 13th edition or most recent edition at the time of installation.
  10. TIA 758-A - Customer owned Outside Plant Telecommunications Infrastructure Standard (2004), including all applicable addenda and the most recent revision at the time of installation.
  11. BICSI Information Transport Systems Installation Manual - 5th edition or most recent edition at the time of installation.
  12. ANSI/NFPA-70 - 2017 National Electrical Code, revision, or most recent revision at the time of installation.
  13. ANSI/IEEE C-2 - 2017 National Electrical Safety Code or most recent revision at the time of installation.
  14. OSHA Standards and Regulations All applicable
  15. Local Codes and Standards All applicable
- C. Note: Anywhere cabling standards conflict with electrical or safety codes, Contractor shall defer to NEC and any applicable local codes or ordinances, or default to the most stringent requirements listed by either. Knowledge and execution of applicable codes is the sole responsibility of the Installer. Any code violations shall be remedied at the Contractor's expense.

## **1.7 ACCEPTABLE MANUFACTURERS:**

- A. General:
  1. Unapproved product substitutions are not allowed. Contractor wishing to substitute any products for those expressly specified shall submit three samples of the

alternate product to Engineer no less than two weeks prior to the last addendum accompanied by all engineering documents, drawings and third party test data proving mechanical and transmission equivalency. Acceptance of substitutions shall be received from Engineer in writing. All unapproved substitutions installed shall be removed by Contractor who shall assume all costs for removal and replacement with approved products. Such costs shall include, but not be limited to labor, materials, as well as any penalties or fees for late completion.

**B. APPROVED MANUFACTURERS:**

1. Contractor shall select only one line item in the each section of Parts 2, 3, and 4. Contractor shall NOT utilize multiple line items for the project within each Part. For example, if Panduit / General Cable is selected to be used for the project, all copper cabling and connectivity shall be by Panduit or General Cable. No other manufacturer or combination of manufacturers may be used for the copper cabling or connectivity equipment.
2. Copper Cabling / Connectivity Approved Manufacturers:
  - a. Hubbell Premise Wiring
3. Fiber Cabling Approved Manufacturers
  - a. Same manufacturer from Part 2.
  - b. Corning
4. Non-Cabling / Connectivity Approved Manufacturers:
  - a. Hubbell Premise Wiring

**1.8 SUBMITTALS:** Refer to Section 26 0502 for requirements.

**PART 2 - PRODUCTS**

**2.1 GENERAL:**

- A. All products shall be in new condition and UL listed.
- B. Provide complete raceway, outlet boxes and miscellaneous items. All conduit utilized shall be EMT grade.
- C. Provide 5" x 2.875" (or 4-11/16" x 3.25" square) deep square outlet box at each outlet location with single gang plaster or tile ring. Provide wall board adapters / accessories as necessary.
  1. Approved solutions:
    - a. RANDL 5 Square Telecommunications Outlet Box Model TX-550-YY where "X" could be a bracket box and "YY" could be knockout arrangements.
    - b. Hubbell Large Capacity Wall Box Model HBL260. If a 2" knockout is required for installation purposes, provide this box.
- D. Communication grounding and bonding shall be constructed and installed to meet or exceed the requirements of the National Electrical Code (NEC), IEC 1000-5-2 and ANSI/J-STD--607-A throughout the entire grounding system.
- E. All termination hardware shall be rated to meet specified cabling specifications.

**2.2 ENTRANCE FACILITY (EF) / EQUIPMENT ROOM (ER) / TELECOMMUNICATIONS ROOM (TR)**

**A. General:**

1. Contractor shall be responsible for the adequate and appropriate design of all racking systems, paying particular attention to sizing of all cable management

troughs and supports both horizontal and vertical installation of patch panels and wire management into rack.

2. Provide line surge suppressors at main telephone board in ER for all incoming phone lines if not provided by service provider. Provide ground connection to TMGB.
3. School District Specific Backbone Requirements:
  - a. Provide 12 Strand Armored Single mode OS2 Fiber from ER/MDF to each TR/IDF.

B. Provide the following, see specifications for each item in this document:

1. Wall Linings in each EF, ER, and TR:
  - a. In addition to the architectural walls, provide plywood wall lining that mounts at 8" A.F.F that shall:
    - i. Be fire-rated or treated on all sides with at least two coats of fire-resistant light-colored paint. Fire-retardant plywood is also acceptable. Leave fire rated stamp on plywood unpainted.
    - ii. Have walls lined with A/C grade or better, void-free plywood, 8 feet high with a minimum thickness of ¾". See plans for additional wall locations.
    - iii. Install the plywood with grade A surface exposed. Plywood shall be securely fastened to wall-framing members to ensure that it can support attached equipment.
    - iv. Use flush hardware and supports to mount plywood.
    - v. Plywood shall be void free and kiln-dried to a maximum moisture content of 15 percent to avoid warping.
2. Main Cross Connect (MC) / Horizontal Cross Connects (HC):
  - a. Floor Mounted Racks (See Plans for Locations):
    - i. Four Post (Located in MDF/ER only):
      1. Provide Four post 19" wide minimum 7' tall EIA aluminum rack with ANSI/EIA 310-D rail size, 45RU capacity, painted black, top flanges, and mounting holes.
      2. Provide paint-piercing washers to electrically bond racks.
      3. Approved Equipment
        - a. Hubbell: SF841936T, 45RU 84" Height, 36" Deep
    - ii. Two Post:
      1. Provide two post 19" wide minimum 7' tall EIA aluminum rack with ANSI/EIA 310-D rail size, 45RU capacity, painted black, top flanges, and mounting holes.
      2. Provide paint-piercing washers to electrically bond racks.
      3. Approved Equipment
        - a. Hubbell: HPW84RR19, 45RU 84" Height

- b. Wall Mounted Cabinet (See Plans for Locations)
  - i. Provide black cabinet, with swing out cabinet body, perforated front door, and black color. Door shall be lockable.
  - ii. Size cabinet to accommodate all passive equipment necessary. Plan for 6RU minimum of active equipment.
  - iii. Provide horizontal slack manager and 3" cable bend radius posts.
  - iv. Provide cabinet fan kit.
  - v. Approved Equipment
    - 1. [Hubbell HLQ24 Quadcab](#)
    - 2. [Hubbell HLQ36 Quadcab](#)
    - 3. [Hubbell HLQ48 Quadcab](#)

- c. Flat Copper Patch Panels:
  - i. Provide flush mount flat unloaded patch panels of required number and size to accommodate shown telecommunications outlets on plans. Provide horizontal cable managers of matching manufacturer.
  - ii. Size panels to provide minimum 25% spare capacity. Fill all available space in remaining patch panels so that panels are fully populated.
  - iii. Support Category 6A or higher applications.
  - iv. Provide keystones or inserts to match School District specific cable system colors/identifiers.
  - v. Shall accommodate 8-Pin 8-Contact (8P8C) ports.
  - vi. Mount to standard EIA 19" rack.
  - vii. Each patch panel shall include mounted behind it one "towel rack" style cable support bar for each 24 connections that the Contractor shall dress cables using hook and loop type cable ties.
  - viii. Approved Equipment

| <u>Manufacturer</u> | <u>Model Name</u> | <u>Flat Patch Panel</u> |
|---------------------|-------------------|-------------------------|
| Hubbell             | NextSpeed         | HPJ24                   |
| Hubbell             | NextSpeed         | HPJ48                   |

| <u>Manufacturer</u> | <u>Model Name</u> | <u>"Towel Rack" cable support bar</u> |
|---------------------|-------------------|---------------------------------------|
| Hubbell             | NextSpeed         | HPRCMB                                |

- d. Fiber Shelves and Cassettes
  - i. Provide fiber shelves and cassettes as required to complete project with a maximum of 36 strands in 1RU.
  - ii. Provide rack mounted, sliding type fiber trays as required to complete project.
  - iii. Provide OS2 fiber adapter patch panels that contain modular, dual LC adapter panels as required to complete project. Color for OS2 ports to be blue.

- iv. Provide minimum 25% spare capacity of fiber adapter panels. Provide additional rack mounted fiber trays/fiber adapter patch panels if necessary to meet 25% spare capacity requirement.
- v. Approved Equipment

| <u>Manufacturer</u> | <u>Model Name</u> | <u>Fiber Shelf</u> | <u>Cassette (OS2)</u> |
|---------------------|-------------------|--------------------|-----------------------|
| Hubbell             | FiberHubb         | FCR1U3SP           | OCSPLCQ24S2           |

e. Vertical Cable Managers:

- i. Provide a double sided vertical cable management panel on both sides of rack.
- ii. Manager shall consist of a metal backbone with cable management fingers that align with EIA rack spacing. Provide cover for all cable management.
- iii. Vertical panel shall be able to manage all the cable on the rack without the aid of horizontal cable managers.
- iv. Size all vertical cable managers according to factory recommendations for the cable being installed. In no case shall design require more than 35% fill ratio when rack is fully populated.
- v. Provide molded plastic slack spools in front to facilitate minimum bend radius compliance.
- vi. Minimum width to be 6".
- vii. Approved Equipment
  - 1. 6" wide, double sided with doors: Hubbell VM620
  - 2. 8" wide, double sided with doors: Hubbell VM820
  - 3. 10" wide, double sided with doors: Hubbell VM1020

f. Horizontal Cable Management

- i. Provide horizontal cable management capable of managing copper and fiber cables.
- ii. Manager shall consist of bend radius control throughout the fingers, pass through holes, and transitions between horizontal and vertical pathways.
- iii. Provide front hinged cover that shall open 180 degrees.
- iv. Manager should mount to standard EIA 19" rack.
- v. Size according to factory recommendations for the cable being installed. In no case shall design require more than 40% fill ratio when rack is fully populated.
- vi. Approved Equipment
  - 1. Hubbell HM277C

g. Power Distribution Units (PDUs)

- i. Provided by School District IT Department.  
Uninterruptible Power Supply (UPS)
- ii. Provided by School District IT Department.

h. Cable Tray (only within the EF/ER/TR)



- i. This cable tray section is only applicable within the EF/ER/TR and does not apply outside of those spaces. See specification 26 0536 Raceway Systems for any cable tray requirements outside of the EF/ER/TR (if applicable to the project.)
- ii. Provide overhead ladder tray:
  1. Tray shall have minimum 6" rung spacing.
  2. Mount tray 18" above racks unless otherwise noted. Provide additional vertical tray as required to provide pathways between the tray above racks and the tray entering the communications room from outside.
  3. Size tray according to quantity of cables entering space. However, in no case shall the tray be smaller than 4" high by 6" wide. Do not exceed 50% cable fill of tray.
  4. For overhead installations, utilize profile supports to support tray every 5'-0".
  5. For wall mounted installations, utilize shelf brackets to support tray every 5'-0".
  6. Provide blind ends to provide closure for a dead-end tray.
  7. Provide cable rollers, two at each 90-degree bend. A radius shield or horizontal bend radius may also be used in lieu of cable rollers.
  8. Provide drop-out fittings, or waterfalls, over each cabinet of sufficient quantity to provide an acceptable path for cables to enter equipment. For single cables leaving the tray, utilize a cable drop-out in lieu of a waterfall.
  9. Cables must enter the racks from the top.
  10. Provide conduit to tray adapters for each conduit terminating to cable tray.
- iii. Acceptable Manufacturers
  1. Hubbell NextFrame Cable Ladder Rack Runway

## 2.3 CABLING DISTRIBUTION SYSTEMS AND MISCELLANEOUS EQUIPMENT

### A. General:

1. Provide plenum rated cable/connectors if required, cabling/connectors must be appropriate for the environment that it is installed in. Provide wet rated cable for all wet locations, including any conduit in or below slab on grade.
2. Contractor shall be responsible for sizing all pathways such that newly installed cable represents not more than a 35% fill as per manufacturer's directions. Overfilled pathways are the sole responsibility of the Contractor who shall remove and reinstall at Contractors expense.
3. Provide products rated for the environment that it is installed in (i.e. riser, plenum, outdoor). All cabling installed in wet locations (i.e. underground conduit, conduit in slab on grade) shall be listed for use in wet locations. Cabling rated for wet location/OSP to be ran entirely in conduit to within 50' of IDF/MDF room. OSP cabling may not be free-aired or utilize cable tray due to lack of plenum rating.

### B. Backbone Cabling Distribution System – Optical Fiber

1. General:

- a. Provide an optical fiber backbone cabling distribution system between telecommunication spaces. Provide OFNR or OFNP as required. Provide 900µm tight-buffered optical fiber cable for premise cable and loose tube for outside plant cable.
  - b. Provide fiber jumpers of appropriate length and cable type for each terminated optical fiber port to be connected.
2. Single-Mode Fiber Optic Cable (OS2)
- a. All singlemode optical fiber cabling shall be 9/125µm.
  - b. All singlemode optical fiber cabling shall be Armored.
  - c. Provide minimum of two strands for every 48-port patch panel.
  - d. Approved Equipment

| <b>Manufacturer</b> | <b>Model</b> | <b>Premise Cable (Tight Buffer)</b> |               | <b>Outside Plant (Loose Tube)</b> | <b>Indoor/Outdoor</b> |
|---------------------|--------------|-------------------------------------|---------------|-----------------------------------|-----------------------|
|                     |              |                                     | <b>Plenum</b> |                                   |                       |
| Hubbell             | FiberHubb    |                                     | HFCD15xxPS    | HFCH2xxxRSBK                      | HFCD140xxRSBK         |

3. Connectors:
- a. Provide LC-Duplex Connectors.
  - b. Mechanical connectors are acceptable. Do not utilize polish type connectors. Clean all preterm connectors, no exceptions.
  - c. For all simplex connectors, provide duplex type clip.
  - d. Approved Manufacturers:

| <b>Manufacturer</b> | <b>Single-Mode (OS2)</b>          |
|---------------------|-----------------------------------|
| Hubbell             | Mechanical:<br>FCLC900KSM12       |
| Hubbell             | Fusion Splice-on:<br>FCLCF900SMBP |

4. Primary Protection (Surge Protection)
- a. General
    - i. Provide surge protection for each pair of copper cabling between buildings and any end point devices that are located outside. For example, if a camera is mounted or located on the exterior of the building—surge protection is required.
    - ii. Surge suppressions shall be achieved through 5-pin, solid state, plug-in type modules for each conductor pair.
    - iii. Provide necessary grounding of equipment to building electrical ground. Size all grounding conductor based on distance to electrical ground according to the requirements of this section.
    - iv. Provide 25% spare modules.
    - v. Approved Equipment
      - 1. For data outlets where POE is present
        - a. ITWLinx 1Gb CAT6-POE.
      - 2. For outlets where no POE is present
        - a. ITWLinx 1Gb CAT6-LAN

3. For copper multi-pair backbones
    - a. ITWLinx ML25-CAT5-75
  4. If power is required on all four pairs. (Note: If Cisco switches are connected via a copper backbone, this product is required.)
    - a. ITWLinx 1Gb CAT6-75
- C. Horizontal Cabling Distribution System – Balanced Twisted Pair
1. General:
    - a. Provide appropriate number of Category 6A horizontal cables, patch cables, work area cables, for all terminated data drops, between switches, etc. so that building-wide networking will be operational once all installation is complete.
  2. Horizontal Cabling
    - a. Provide Cat 6A UTP, min-compliant, 4-Pair 100Ω Balanced Twisted Pair Cable to all locations shown on plans.
    - b. Provide cabling rated for the environment that it is installed in (i.e. underground conduit, conduit in slab on grade). All cabling installed in wet locations shall be listed for use in wet locations.
    - c. Provide a minimum of (2) cables, unless otherwise noted, to each location shown on plans.
      - i. Provide (2) Category 6A cables to each wireless access point (WAP).
        - a. Locate drops in near center of classroom in biscuit jack above ceiling grid, label on ceiling grid on locations that biscuit is used instead of faceplate.
        - b. WAPs should be provide at a minimum of the following locations: Stage, Gym Cafeteria, Office Areas, Counseling office, Dance, Wrestling, Band, Choir, Foods, Common Area where kids would be sitting. See plans for additional locations and provide accordingly.
        - c. Wireless access points to be owner furnished, contractor installed (OFCI)
    - d. Horizontal cable colors (Verify with owner prior to ordering cable):
      - i. Telephone/Data = Black
      - ii. Wireless Access Point (WAP) = White
      - iii. IP Surveillance Cameras = Green
      - iv. AV = Purple
      - v. Intercom = Purple
      - vi. Elevator = Black
      - vii. Access Control = Red
      - viii. Intrusion = Red
    - e. Approved Equipment

| <u>Manufacturer</u> | <u>Model</u> | <u>Plenum</u> |
|---------------------|--------------|---------------|
|                     |              |               |

|         |           |                   |
|---------|-----------|-------------------|
| Hubbell | NextSpeed | C6ASPDSBK (black) |
| Hubbell | NextSpeed | C6ASPDSW (white)  |
| Hubbell | NextSpeed | C6ASPDSBK (green) |
| Hubbell | NextSpeed | C6ASPDSP (purple) |
| Hubbell | NextSpeed | C6ASPDSR (red)    |

f. Field Terminable Plug (FTP)

- i. Provide an FTP for each WAP. Provide two FTPs for each WAP. Confirm FTPs are compatible with WAPs.

g. Approved Equipment

| <b>WAP Field Terminable Plug</b> |              |
|----------------------------------|--------------|
| <b>Manufacturer</b>              | <b>Model</b> |
| Hubbell                          | SCP6A        |

3. Patch and Work Area Cables:

- a. Patch Cables shall match colors specified above.
- b. Provide and install (1) 7-foot-long patch cable for each workstation, except for classroom locations where (1) 15-foot-long patch cable is to be provided, and (1) 5 foot or 7 foot patch cable for each patch panel port in the TR/TC. Provide half of the TR/TC patch cables in 5 foot lengths and the remaining half in 7 foot lengths. Verify final patch cable lengths with owner prior to ordering.
- c. No patch or work area cords shall in any case exceed in total 10 meters as per TIA Standard unless design includes Standards compliant MUTOA (multi-user termination outlet) and work area cord adjustments are made according to recommendations for zone cabling contained within TIA 568-C or most recent revision at the time of installation. Coordinate with owner for preferred patch cord lengths at patch panel and work area.
- d. Copper patch cord and work area outlet cabling must be provided by the same manufacturer and meet the same performance standards as the horizontal cabling.
- e. Patch cord and work area cables shall be black.
- f. Provide (1) 6 foot, 2-strand optical fiber patch cable for each patch panel, utilizing same performance standards and connector types as specified for the backbone. The cable shall be provided by the same manufacturer and meets the same performance standards as the backbone optical fiber. Verify final patch cable lengths with owner prior to ordering.
- g. Approved equipment

| <b>Manufacturer</b> | <b>Model</b> | <b>Patch Cord Cat 6A</b> |
|---------------------|--------------|--------------------------|
| Hubbell             | NextSpeed    | HC6Axx05 (5')            |
| Hubbell             | NextSpeed    | HC6Axx07 (7')            |
| Hubbell             | NextSpeed    | HC6Axx15 (15')           |
| Hubbell             | FiberHubb    | DFHRCLCLCS2SM            |

- h.
- 4. Telecommunications Outlets/Connectors (See Plans for Locations):
  - a. Flat Faceplates:
    - i. Provide modular type information outlets with flat telephone jack or data outlet. Provide single gang faceplate kits to allow up to six data or voice jacks as shown on plans. Provide faceplate kits for wall outlets in colors and materials that match power wiring device plates. Provide faceplate kits that allow labeling schemes described herein. Faceplates shall accept STP, UTP, fiber optic or audio/video modules as an option.
    - ii. Provide keystones or inserts to match School District specific cable system colors/identifiers.
    - iii. Blank off all unused ports.
    - iv. Color: Stainless Steel Faceplates
  - b. Flat Connector:
    - i. Color: Standard color as selected by owner/architect.
  - c. Approved equipment

| <u>Manufacturer</u> | <u>Model</u>          | <u>Connector Cat 6A</u> |
|---------------------|-----------------------|-------------------------|
| Hubbell             | NextSpeed, Cobra Lock | HJU6Axx                 |

| <u>Flat Plate</u>   |              |                                   |  |
|---------------------|--------------|-----------------------------------|--|
| <u>Manufacturer</u> | <u>Model</u> | <u>Stainless Steel Faceplates</u> |  |
| Hubbell             | NextSpeed    | SSFL11                            |  |
| Hubbell             | NextSpeed    | SSFL12                            |  |
| Hubbell             | NextSpeed    | SSFL13                            |  |
| Hubbell             | NextSpeed    | SSFL14                            |  |
| Hubbell             | NextSpeed    | SSFL16                            |  |
| Hubbell             | NextSpeed    | SFSBGY10<br>(blanks)              |  |

**PART 3 – EXECUTION**

**3.1 GENERAL**

- A. Prior to pathway rough-in, low voltage contractor shall meet with electrical contractor to review pathway installation requirements.
- B. Pathway Requirements:
  - 1. General:
    - a. All pathways shall be designed, constructed, grounded and installed in accordance with all recommendations delineated within TIA 569-B and Standard TIA 942.
    - b. Prior to placing any cable pathways or cable, the contractor shall survey the site to determine job conditions will not impose any obstructions that

would interfere with the safe and satisfactory placement of the cables. Field coordinate alternate pathway requirements with other trades onsite. New pathways shall not exceed distance limitations defined within this specification. Notify the Engineer of the changes for final approval prior to proceeding with the change.

- c. Paint all electrical boxes and their covers for the telephone and data system matte white. See specification 26 0553 for additional identification information.
2. Cable Tray Within EF/ER/TR:
    - a. Wrapped around room (wall support is acceptable)
    - b. Along equipment rows leading to cross-connects.
    - c. Ground tray to TGB or TMGB (whichever is closer) utilizing #6CU bare wire.
    - d. Coordinate tray locations with lighting, air-handling systems, and fire extinguishing systems so that fully loaded trays will not obstruct or impede their operation.
      - i. Install cable tray under mechanical components for access for future cabling needs; coordinate the mounting height of the cable tray with Owner IT Representative prior to installation. Do not install cable tray at the top of a ceiling which is inaccessible due to the excessive height.
3. Racks / Cabinets:
    - a. Racks shall be securely attached to the concrete floor using minimum 3/8" hardware or as required by local codes.
    - b. Racks shall be placed with a 36-inch (minimum) clearance from the walls on all sides of the rack. When mounted in a row, maintain a minimum of 36 inches from the wall behind and in front of the row of racks and from the wall at each end of the row.
4. Conduits:
    - a. For any interior/exterior conduit 4" and larger, provide (3) 1.25" plenum-rated corrugated innerducts.
    - b. Flexible conduit is not acceptable as cable tends to creep, shift, or have sheath damage.
    - c. Achieve the best direct route parallel with building lines with no single bend greater than 90 degrees or an aggregate of bends in excess of 180 degrees between pull points or pull boxes.
    - d. Conduit runs shall not have continuous sections longer than 100 feet without a pull box and may only be filled to 35% capacity.
    - e. Ream all conduit ends and fit with an insulated throat nylon bushing with non-indenter type malleable steel fittings to eliminate sharp edges.
    - f. Telecommunications conduits should not be routed over or adjacent to heat sources such as boilers, hot water lines, or steam lines. Neither should they be routed near large motors, generators, photocopy equipment, or electrical power cabling and transformers.
    - g. Conduits that enter an EF/ER/TR must terminate near the corners to allow for proper cable racking. Terminate these conduits as close as possible to the wall where the backboard is mounted to minimize the cable route.

- h. Terminate conduits that protrude through the structural floor 1" to 3" above the surface within an EF/ER/TR.
  - i. After installation, conduits shall be clean, dry, unobstructed, capped for protection, labeled for identification, reamed and fitted with bushings.
  - j. A 200lb pull cord (nylon, 1/8" minimum) shall be installed in any empty conduit.
  - k. When the number of conduits requires more than one row, restrict the number of rows to two wherever practicable.
5. Open Top Cable Support Requirements:
- a. Provide wide surface area open-top cable supports spaced 5 feet apart at the maximum to adequately support and distribute cable's weight. Follow manufacturer specifications for cable loading. Provide supports that have a galvanized finish with wide base specifically for telecommunications cabling.
  - b. Non-continuous cable supports shall provide a bearing surface of sufficient width to comply with required bend radii of high-performance cables
  - c. Non-continuous cable supports shall have flared edges to prevent damage while installing cables.
  - d. Multi-tiered non-continuous cable support assemblies shall be used where separate cabling compartments are required. Assemblies shall consist of a steel angled hanger bracket holding up to six non-continuous cable supports.
  - e. Approved Equipment
    - i. Erico Caddy-Cat HP
6. Pull Box Requirements:
- a. NEC sized pull boxes are not acceptable. Follow BICSI and EIA/TIA 569-B guidelines for pull box sizing.
  - b. Provide pull boxes in sections of conduit that are 100 feet or longer, contain more than two 90-degree bends, or contain a reverse bend.
  - c. Conduits that enter the pull box from opposite ends should be aligned.
  - d. Pull boxes shall have a length 12 times the diameter of the largest conduit.
  - e. All pull boxes must be accessible.
- C. Cabling System:
- 1. Follow T568B scheme for copper cabling terminations.
  - 2. Life Safety Related Cabling:
    - a. Provide the specified category cabling in 1" conduit from elevators and or lifts. Cabling shall terminate at telephone service demarcation point.
    - b. Provide the specified category cabling in 1" conduit for two phone lines to the fire alarm control panel back to telephone service demarcation point.
    - c. Provide the specified category cabling in 1" conduit for the two-way communication system Main Control Panel back to telephone service demarcation point.
  - 3. Miscellaneous Related Cabling:
    - a. Provide the specified category cabling in 1" conduit for two data connections to Intrusion Detection System head-end back to EF or demarcation room. Refer plans for exact locations.

- b. Provide the specified category cabling in 1" conduit for two data connections to Access Controls System head-end back to closest data rack. Refer to plans for exact locations.
  - c. Provide the specified category cabling in 1" conduit for one data connection to Intercom head-end back to closest data rack. Refer to plans for exact locations. Provide specified category cabling and conduit between intercom head-end and access control panel.
  - d. Provide the specified category cabling in 1" conduit for Main Building Management System (ATC Panels, etc) back to nearest ER/TR room. Refer to Mechanical plans for exact location.
  - e. Provide the specified category cabling in 1" conduit for one data connection to each lighting controller/relay panel back to nearest ER/TR room. Refer to plans for exact locations.
  - f. Provide the specified category cabling in 1" conduit for one data connection to each irrigation controller back to nearest ER/TR room. Refer to plans for exact locations.
  - g. Provide the specified category cabling in 1" conduit for Advanced Energy & Power Metering System back to Main Building Management System Panel. Refer to plans for main switchboard location.
  - h. Provide the specified category cabling in 1" conduit for two data connections to PV Solar System head-end units panel back to nearest ER/TR room. Refer to plans for exact locations.
- 4. Backbone cables shall be installed separately from horizontal distribution cables. Provide plenum rated innerduct if required, innerduct must be appropriate for the environment that it is installed in.
  - 5. It is acceptable to install innerduct within cable tray as long as the fill ratio is not exceeded.
  - 6. Fiber slack shall be neatly coiled within the fiber enclosure or cable tray. No slack loops shall be allowed external to the fiber panel. Each cable shall be individually attached to the respective fiber enclosure by mechanical means.
  - 7. Provide a minimum of one balanced twisted pair cable to each voice outlet and one balanced twisted pair cable to each data outlet shown on the drawings unless noted otherwise on the drawings.
  - 8. Service Loop Requirements
    - a. Provide a minimum 6" service loop in each communications system junction box for balanced twisted pair. Cables shall be coiled in the in-wall boxes if adequate space is present to house the cable coil without exceeding manufacturers bend radius.
    - b. Provide a minimum 10' service loop in each EF/ER/TR/TE.
    - c. Provide a minimum 2' service loop at each stub-up or at each transition from conduit to cable tray.
    - d. Provide a 5' service loop in the ceiling before the conduit travels down the wall and terminates into the communications junction box.
    - e. Provide a 15' loop at all wireless access point (WAP) locations above the ceiling.
      - i. Provide cable in biscuit box.
    - f. Provide a 15' loop at all IP surveillance camera locations above the ceiling.
      - i. Provide cable in biscuit box.



9. Provide modular jacks for each installed cable at outlets shown on drawings. Blank off all unused ports on faceplate.
10. Provide Velcro type ties for all cables and install in a neat and workmanlike manner. Where applicable, use plenum rated Velcro. Where cable is installed in cable tray, bundle a maximum of 25 cables in each Velcro tie. No zip ties are permitted whatsoever, even for temporarily hanging cables during the installation process
11. The bending radius and pulling strength requirements of all backbone and horizontal cables shall be observed during handling and after installation. Use pulling compound as recommended by manufacturer.
12. All horizontal cables, regardless of media type, shall not exceed 90 m (295 ft) from the telecommunications outlets in the work area to the horizontal cross connect.
13. The combined length of all patch cords in the EF/ER/TR and the work area shall not exceed 10m (33 ft)
14. No splices are allowed.
15. In a false ceiling environment, a minimum of 3 inches shall be observed between cable supports and false ceiling. At no point shall cable(s) rest on acoustic ceiling grids or panels.
16. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
17. Cables shall not be attached to ceiling grid seismic support wires or lighting fixture seismic support wires. Where support for horizontal cable is required, the contractor shall install appropriate carriers to support the cabling.
18. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to the Owner.
19. Pulling tension for balanced twisted pair shall not exceed 25lbf and for optical fiber shall not exceed 50lbf.
20. Pair untwist at the termination shall not exceed 0.125". The cable jacket shall be maintained as close as possible to the termination point.
21. Cables shall be neatly bundled and dressed to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.
22. Cable shall not be draped on, tied or otherwise secured to electrical conduit, plumbing, ventilation ductwork or any other equipment. Cable shall be secured to building supports or hangers or to additional blocks or anchors specifically installed for this purpose.
23. Copper Backbone Terminations:
  - a. Terminate one single pair on pins 4, 5 at each patch panel port. Terminate all pairs on patch panel located on rack.

D. Grounding System:

1. All grounding and bonding shall be done according to ANSI J-STD-607-A, TIA 942, and NEC.
2. All cabinets/racks shall utilize paint piercing grounding washers, to be used where rack sections bolt together, on both sides, under the head of the bolt and between the nut and rack.
3. All racks shall further utilize a full-length rack ground strip attached to the rear of

the side rail with the thread-forming screws provided to ensure metal-to-metal contact. Similar to Panduit RGS.

4. All active equipment from owner shall be bonded to ground. If the equipment manufacturer provides a location for mounting a grounding connection, that connection shall be utilized. All active equipment shall be bonded using the appropriate jumper for the equipment being installed using the thread-forming screws. Similar to Panduit RG.
5. Racks shall have individual, appropriately sized conductors bonded to the grounding backbone. Do not bond racks or cabinets serially – daisy-chained rack grounds will not be accepted.
6. Patch panels shall be bonded to racks using the appropriate bonding screws. Mounting rails may utilize cage nuts, threaded holes or thru hole mounting fasteners to secure patch panels to the rails.
7. Bond cable tray, raceway system, structural steel and all other metal equipment located within EF/ER/TR to the grounding bus bar utilizing copper conductors per the following schedule:
  - a.  $\leq 25'$  - #34
  - b.  $\leq 50'$  - #2
  - c.  $\leq 66'$  - #2/0
  - d.  $\geq 67'$  - #3/0
8. Provide 4" X 12" X 1/4" CU Telecommunication Main Grounding Bus Bar (TMGB) with bonding conductor per schedule above to Intersystem Bonding Terminal (IBT) in each telecommunication room (EF/ER/TR) with a main cross-connect (MC). Provide 20% spare termination spaces on bus bar, provide additional bus bars as necessary to accommodate spare.
9. Provide 2" X 12" X 1/4" CU Telecommunication Grounding Bus Bar (TGB) with bonding conductor per schedule above to TMGB in each room with a horizontal cross-connect (HC).
10. Refer to electrical diagrams for additional ground connection requirements.

E. Electromagnetic Compatibility:

1. General:
  - a. Do not install power feeders above or within the telecommunications room. Do not install telecommunications conduits above electrical panelboards, switchboards, transformers, motor control centers, etc.
  - b. Where telecommunication cable is installed in grounded, metallic conduit near power cables, the power cables shall be kept physically separated from telecommunications cables:
    - i. Circuits Under 5kVA: 2" minimum separation.
    - ii. Circuits Over 5kVA: 6" minimum separation.
    - iii. Electrical motors/transformers: 48" minimum separation.
    - iv. Lighting ballasts: 6" minimum separation.
  - c. Where telecommunication cable is installed in cable tray or underground in non-metallic conduit near power cables, the power cables shall be kept physically separated from telecommunications cables by a minimum of 12"

F. EF/ER/TR Power Requirements:

1. General: Regardless of what is shown on drawings, the minimum requirements for providing power in the EF/ER/TR are as follows and shall be included in bid:

- a. (1) dedicated, nonswitched 120V/20A 4-plex receptacles, per each data rack, each on individual branch circuits. Outlet to be located near the top of the data rack.
      - i. Provide (1) 120V/30A Nema 5-30R receptacle to the main 4 post rack. Remaining racks within the space to be dedicated 120V/20A 4-plex receptacles as indicated above.
    - b. 120V/20A Duplex receptacles located +18" A.F.F. placed at 6 foot intervals around perimeter walls. Up to 10 receptacles may be placed on a single circuit.
- G. Firestopping and Smoke/Acoustical Pathways(See Also Division 7):
  - 1. Provide firestop/smoke barrier solution equivalent to the wall/ceiling/floor rating.
  - 2. Provide firestop labels next to each penetration with written date. Label both sides of the penetration.
  - 3. Firestop systems shall be UL Classified to ASTM E814 (UL 1479). A drawing showing the proposed firestop system shall be provided to the Engineer prior to installing the Firestop system(s).
  - 4. Utilize firestop pass-through type devices for medium to large penetrations into fire walls/floors.
  - 5. Provide a minimum of (4) 4" trade size Hilti Speedsleeves (or STI EZPath) with at least one spare for each and every firewall penetration where cable tray meets the wall.
  - 6. Provide the following products:
    - a. Fire Rated; STI EZ-Path Fire-Rated Pathways Series (or Hilti Speed Sleeve CP 653 BA)
    - b. Smoke/Acoustical Rated; STI EZ-Path Smoke & Acoustical Pathway Series (or Hilti Smoke and Acoustic Sleeve CS-SL SA)
- H. Miscellaneous Equipment:
  - 1. Arrange all terminal blocks in a manner that allows natural wiring progression and minimizes crossing of wires.
  - 2. Provide patch cords and cross connect cables as necessary for a complete operational telephone and data network system. Consult with owner to determine any special needs such as dedicated phone lines.

## **PART 4 – LABELING**

### **4.1 GENERAL**

- A. The contractor shall develop and submit for approval a labeling system for the cable installation. The Owner will negotiate an appropriate labeling scheme with the successful contractor. At a minimum, the labeling system shall clearly identify all components of the system: racks, cables, panels and outlets. The labeling system shall designate the cables origin and destination and a unique identifier for the cable within the system. Racks and patch panels shall be labeled to identify the location within the cable system infrastructure. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme.
- B. All telecommunications spaces, pathways, cables, connecting hardware, equipment, racks, patch panels, outlet/connectors, and grounding system shall be labeled in accordance with TIA/EIA 606-A.
- C. All labels shall meet UL 969 requirements for legibility, defacement and adhesion requirements. Handwritten, Ink, or Laser Printing labels are not allowed. Provide labels

using thermal transfer print. Heat shrinking or wraparound labels are required, flag style labels are not allowed.

#### **4.2 TELECOMMUNICATION PATHWAYS**

- A. Identify each dedicated pathway (including inner ducts) for the voice and data system.
- B. Label pathways at regular intervals and wherever they are accessible.

#### **4.3 TELECOMMUNICATION CABLES**

- A. Identify cables at each end with a permanent label or physical/electronic tag.
  - 1. The same alphanumeric identifiers should be used at both ends of the cable.
  - 2. Identify cables at regular intervals throughout and wherever they are accessible.
  - 3. Cables shall be identified in accordance with the System Documentation Section of this specification and ANSI/TIA/EIA-606-A. The cable label shall be applied to the cable behind the faceplate that can be accessed by removing the cover plate and to the cable behind the patch panel on a section of cable that can be viewed without removing the bundle support ties. Cables labeled within the bundle where the label is obscured from view shall not be acceptable.

#### **4.4 CONNECTING HARDWARE**

- A. Identify connecting hardware items (termination blocks, cross-connects, racks, cabinets, patch panels, telecommunications outlet/connectors, ports) using alphanumeric identification such as the following three-level scheme:
  - 1. First level—Termination field or patch panel. Color-coding or other labeling should be used to uniquely identify each termination field (e.g., voice and data) on a common mechanical assembly.
  - 2. Second level—Terminal block within a given field or patch panel that could be a row of insulation displacement connectors (IDCs), optical fiber connectors, or modular jacks.
  - 3. Third level—Defines the individual position within a given terminal block or patch panel.

#### **4.5 TELECOMMUNICATIONS GROUNDING SYSTEM**

- A. Identify each telecommunications grounding bus bar (TGB) and telecommunications main grounding bus bar (TMGB).
- B. Identify each grounding conductor relating to the telecommunications system, including those connecting building steel, grounding electrodes, water pipes, and telecommunications structural components.

### **PART 5 - MISCELLANEOUS**

#### **5.1 TESTING:**

- A. General
  - 1. Provide testing within 10 days of completion for all copper and fiber optic cable according to TIA/EIA standards and any other requirements of the manufacturer who will provide warranty.
  - 2. Submit copy of current calibration of all testing equipment. Submit all test reports electronically to architect/engineer and include in O&M manuals to include test reports. Meter shall have been calibrated within the past 12 months.

3. Correct any malfunctions. Contractor shall re-terminate/replace any cable, connection, or equipment found to be defective or non-compliant with these specifications and referenced standards.
4. Invite Owner IT representative and Engineer to witness and/or review field testing. Notify five business days prior to commencing testing.

**B. Copper Cable**

1. Utilize Level IIIe, IV, V Tester to test all equipment and each outlet, horizontal cable, termination block, patch cords, etc. to verify compliance with requirements. Testing shall consist of industry accepted verification tests for the Category of cable installed and shall meet latest requirements of EIA/TIA cabling Standards.
2. UTP Cable and Links: All UTP cabling channel must be tested at swept frequencies up to 250MHz for internal channel performance parameters as defined in IEEE 802.3an and ANSI/TIA/EIA-568C. Certifications shall include the following parameters for each pair of each cable installed:
  - a. Wire map (pin to pin connectivity)
  - b. Length
  - c. Insertion Loss
  - d. Near End Crosstalk (NEXT)
  - e. Attenuation to Crosstalk Ratio Far End (ACRF)
  - f. Return Loss
  - g. Propagation Delay
  - h. Delay Skew
  - i. DC Loop Resistance
  - j. DC Resistance Unbalance
  - k. Power Sum Near-End Crosstalk (PS-NEXT)
  - l. Attenuation to Crosstalk Ratio Near-End (ACR-N)
  - m. Power Sum Attenuation to Crosstalk Ratio Near-End (PS-ACR-N)
  - n. Attenuation to Crosstalk Ratio Far-End (ACR-F)
  - o. Power Sum Attenuation to Crosstalk Ratio Far-End (PS-ACR-F)
  - p. Transverse Conversion Loss (TCL)
  - q. Equal Level Transverse Conversion Transfer Loss (ELTCTL)
3. All channels that fail testing parameters will be replaced at the Contractor's expense until all channels pass the performance parameters.
4. Provide Modular Plug Terminated Link (MPTL) test for all field terminated plugs (standard for cameras and WAPs).
  - a. All installed cabling modular plug terminated links (MPTL) shall comply with the permanent link transmission requirements of the ANSI/TIA-568-2.D standard.
  - b. The MPTL shall be tested with a Permanent Link Adapter on the Main Unit and a Patch Cord Adapter Suitable for Category 6A testing on the Far End or Remote Test Equipment.
  - c. Modular plug terminated link test results, including the individual frequency measurements from the tester, shall be recorded in the test instrument upon completion of each test for subsequent uploading for reports to be generated.



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## SECTION 27 4100

### AUDIOVISUAL SYSTEMS

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26, 27 & 28 basic materials and methods sections apply to work specified in this section.
- C. Refer to specification 26 0553 for conduit and junction box color requirements.
- D. Refer to specification 27 1500 for category and/or optical fiber cable and connectivity specifications.
- E. All unshielded category 'UTP' and/or optical fiber cable, for AV equipment, used on this project shall match the horizontal cabling within the building.
  - 1. Category cables used for transporting video, audio and controls simultaneously from transmitters to receivers and/or switchers shall follow the Manufacturer's recommend cabling specifications.

##### 1.2 ADMINISTRATIVE REQUIREMENTS:

- A. BNA Project Contact:
  - 1. Eric Mangum, CTS-D
    - a. Phone: 801-532-2196
    - b. Email: [emangum@bnaconsulting.com](mailto:emangum@bnaconsulting.com)
  - 2. Jaime Verhaal, CTS-D
    - a. Phone: 801-532-2196
    - b. Email: [jverhaal@bnaconsulting.com](mailto:jverhaal@bnaconsulting.com)
  - 3. Sean Graham
    - a. Phone: 801-532-2196
    - b. Email: [sgraham@bnaconsulting.com](mailto:sgraham@bnaconsulting.com)
- B. Bid Submittal:
  - 1. Equipment Costs: Breakout cost of material and labor as different line items. Refer to bid form for breakout cost requirements.
- C. Coordination:
  - 1. Coordinate final inspection of the systems installed, with Audiovisual (AV) Consultant, three (3) weeks in advance.
  - 2. Obtain GANTT chart for construction time frame from the General Contractor.
  - 3. Coordinate with Electrical contractor to meet at least twice with the ceiling installer. Hold first meeting before submittal of shop drawings to coordinate the mounting condition of all ceiling-mounted AV equipment with ceiling type. During second meeting, coordinate the location of all ceiling-mounted AV equipment in each area.
  - 4. Meet at least once with the mechanical installer prior to fabrication and installation of duct work. Coordinate depth and location of all loudspeaker and duct work in all areas.
  - 5. Meet with Electrical contractor prior to pathway rough-in to coordinate AV system requirements in each area.



6. Meet at least once, prior to rough-in, with horizontal cabling installer to verify all AV network requirements. Coordinate cable color according to specification 26 0553.
  7. Meet at least twice with owner and programmer to coordinate AV network requirements. Hold the first meeting after submittal of shop drawings to coordinate network protocols, including but not limited to: IP address schedules, MAC address schedules, patchbay schedules, security requirements, and VLANs. Hold the second meeting prior to AV system deployment.
  8. Coordinate color and finish of all AV system components with Architect or Electrical contractor as appropriate.
  9. Coordinate all AV system components within millwork/furniture with millwork shop drawings prior to rough-in.
  10. Coordinate color (including custom color) and finish of all AV system components with Architect prior to ordering. Architect may require custom color of grills, face plates, etc. AV contractor shall paint or have devices painted by others. The cost for custom colors shall be within the AV Contractors Bid.
  11. Notify AV Consultant when rough-in is complete and ready to inspect. AV Consultant and Electrical Engineer to sign off on rough-in prior to rough-in resuming rough-in for typical rooms.
- D. Contractor is responsible for coordinating with all other trades for equipment locations, mounting requirements, supports and plenum space requirements.
- E. AV contractor shall attend the electrical pre-construction meeting per specification 26 0500.

### **1.3 DESCRIPTION OF WORK:**

- A. Provide the specified systems in a complete and operating condition with all necessary materials and labor to fulfill the requirements and the intent of the drawings and specifications. Except as otherwise indicated, provide manufacturer's standard system components. Contractor shall furnish all cables, materials and equipment, whether specifically mentioned herein or not, to ensure a complete and functional system.
- B. Master quotes do not relieve contractor from performing due diligence for equipment type, equipment quantity, and quantity of room types. Any errors, conflicts, or omissions between the drawings and/or specifications and master quotes shall be the responsibility of the contractor to resolve.
- C. Bidders wishing to provide equipment other than the equipment specified shall submit proposed substitute equipment to AV Consultant eight (8) working days prior to bidding. Submittals for prior approval shall include description of equipment, design intent, complete riser diagrams for proposed equipment, equipment specifications, cut sheets of proposed equipment, reason for alternate equipment. AV Consultant may request physical equipment to test and demo. Acceptance of proposed equipment by AV Consultant shall not relieve AV contractor from responsibility to provide audio-visual systems equal to those specified in this Section. Contractor shall be ultimately responsible for providing complete and working audio-visual systems that function, control and operate in the same manner as the specified equipment. AV Consultant has final say if proposed equipment is equal to the specified equipment. Equipment that AV Consultant is not familiar with will require the contractor to provide manufacturer training at manufacturer's facility and have a manufacturer representative present at time of commissioning.
  1. Refer to section 2.2 for approved equals of basis of design equipment.
- D. Equipment submitted in the bid proposal that has not been approved by AV Consultant in writing will not be accepted and shall be replaced by approved equipment at contractor's expense. Equipment not listed within this specification, or contract documents, that is required for a complete and working system, shall be of professional grade and used in the

same manner as needed for a complete and working system.

- E. Input plates shall match the color and style being used throughout the project.
- F. All control processors and controllers are to be on an unswitched power connection and connected to an uninterrupted power supply if indicated within the design.

#### **1.4 DEFINITION OF TERMS:**

- A. Approve: The term "approved," where used in conjunction with the Engineer's action on the Contractor's applications and requests, is limited to the Engineer's duties and responsibilities as stated in General and Supplementary Conditions.
- B. Configure: The term "Configures" or "Configuration" is used to describe set up of components which includes menu based settings, image alignment, dip switches, setup wizards, EDID, etc. required for standard functionality.
- C. Contractor: the term "Contractor" refers to the company contracted to perform the work within this specification and associated documents.
- D. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean "directed by the Engineer," "requested by the Engineer," and similar phrases.
- E. Furnish, Install, and Provide: Refer to 26 0500 for definition.
- F. General: Basic Contract definitions are included in the General Conditions.
- G. Graphical User Interface (GUI): The term "Graphical User Interface (GUI)" is used to describe the user interface from a touch screen. This is a custom interface provided with the programming of the system.
- H. Indicated: The term "indicated" refers to graphic representations, notes, or schedules on the Drawings, other paragraphs or schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended.
- I. Installer: An "Installer" is the Contractor, or an entity engaged by the Contractor, either as an employee, subcontractor, or sub-subcontractor, for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
- J. Programming: The term "Programming" is used to describe writing computer code or a sequence of logic to perform an operation from a triggering event. Programming will be installed on a control processor or similar platform identified within the documents.
- K. Programmer: the term "Programmer" is the company or entity engaged by the programming company, either as an employee, subcontractor, or sub-subcontractor, for providing the programming services.
- L. Regulation: The term "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- M. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by the Contractor after award of the Contract are considered requests for "substitutions."

#### **1.5 QUALITY ASSURANCE:**

- A. Installer:
  - 1. Integrating firm shall have worked satisfactorily for a minimum of five (5) years of completing systems equal to this scope, quality, type and complexity.

2. Key personnel assigned to the project shall each have minimum of ten (10) years of experience in completing systems equal to this scope, quality, type and complexity.
  3. Contractor shall be a factory authorized distributor of all equipment specified for the geographical area of the project.
  4. Contractor shall maintain complete installation and service facilities for the duration of the project contract.
  5. Contractor shall have current manufacturer certificates for all AV systems and equipment listed within this specification.
  6. Contractor shall be in good standing with the owner.
  7. Contractors that do not meet the above requirements cannot bid on this project.
- B. Contractor must follow the standards described within:
1. BICSI/AVIXA AV Design Reference manual.
  2. ANSI/AVIXA 2M-2010 Standard guide for Audiovisual Systems Design and Coordination Processes.
  3. ANSI/AVIXA 10:2013 Audiovisual Systems Performance Verification Guide.
- C. All work shall be done by expert technicians qualified in the field with knowledge of specified systems. Workmanship shall comply with industry best practices concerning grounding, shielding, cable dressing, cable termination and equipment mounting.
- D. PRE-APPROVED INSTALLERS:
1. GenComm
  2. Marshall Industries
  3. Performance Audio
  4. Poll Sound
  5. TPI
  6. WEBB AV
  7. Bids submitted by non-approved installers will not be accepted.
  8. Bidders not pre-approved shall submit in writing the following for review at least eight (8) working days prior to bid:
    - a. List of qualifications including:
      - i. Industries certifications including manufacturers.
      - ii. Approved resale manufacturers.
    - b. Past and current projects within the last five (5) years similar in scope and size.
    - c. Three (3) Different referrals from the owners of three (3) different projects within the last five (5) years.

**1.6 SUBMITTALS: Refer to specification 26 0502 for shop drawing submittal requirements.**

**1.7 WARRANTY:**

- A. Systems shall be guaranteed for a period of one (1) year from the date of substantial completion against defective materials, inferior workmanship or improper installation adjustment. Guarantee shall cover all parts and labor, etc. required to maintain the functionality at the time of system completion.
1. System completion shall be signed off by the programmer, contractor, and the owner. At that time the system will be considered complete.

2. The contractor shall utilize their existing service department for warranty calls. Trouble shooting of system components shall be performed before adjustment to the programing is required.
- B. If system failure causes audiovisual system to be inoperative or unusable for its intended purpose, contractor, when notified of the problem, shall repair the system to be operational and usable within three (3) business days. If defective components cannot be repaired in time, provide temporary equipment as required.
  - C. Systems designed for twenty-four/seven (24/7) operation shall be repaired and/or replaced within twenty-four (24) hours of time of notification. If defective components cannot be repaired in time, provide temporary equipment as required.
  - D. Programming warranty includes the following:
    1. Lighting control: limited to 1 change after completion sign off.
    2. GUI: limited to button rearrangement
  - E. Contractor shall honor equipment warranties for term established by manufacturer if greater than warranty time frame mentioned above.

## **PART 2 – PRODUCTS**

### **2.1 GENERAL:**

- A. All equipment shall be installed as shown on the drawings and in strict accordance with the specifications. Any errors, conflicts, or omissions discovered in the specifications or the drawings shall be submitted in writing to the AV Consultant for clarification.
- B. Equipment lists are provided to identify quality and functional expectations. They may not be complete. Coordinate with devices shown on drawings, system risers and equipment lists for system intent. Provide a complete and functional system as described within the construction documents.

### **2.2 MANUFACTURER APPROVED EQUALS:**

- A. The Manufacturers listed below have the potential to be considered equals, as it relates to the system design intent and the equipment specified herein. Any equipment chosen as equal to what has been specified in section 2.4 will be the responsibilities of the AV Integrator to coordinate all resulting changes and guarantee a complete and functional system e.g. rough-in requirements, programming, etc. Please note that some components have been chosen over others for features and/or size limitations. Equipment listed below with an asterisk have feature and/or size limitations and may not be substituted.
  1. Amplifiers – Ashly, Crestron, Crown, Extron, Lab Gruppen, Powersoft, QSC and StewartAudio
  2. Assisted Listening Systems – Listen Technologies, Williams AV
  3. Cables – Belden, Crestron, Extron, Gepco/General, Ice, Kramer, Liberty, and Westpenn cables
  4. Controls – AMX, Crestron and Extron
  5. Displays – LG, NEC, Planar, Panasonic, Samsung, Sharp, and Sony
  6. DSPs – Biamp, Extron, Symetrix
  7. Equipment racks – AtlasIED, Chief, Lowell and Middle Atlantic
  8. Loudspeakers – AtlasIED, Bose, Community, JBL and SoundTube
  9. Microphones – Audio Technica, Sennheiser and Shure
  10. Mounts – Chief and Premier mounts
  11. Network equipment – Cisco, Luxell, and Netgear

12. Networked Audio – Attero tech (QSC), Extron, and RDL
13. Projection Screens – Da-Lite, Draper and Stewart Filmscreen
14. Video Equipment – AMX, Crestron, and Extron
15. Wall plates – Attero tech (QSC), Crestron, Extron, RCI Custom, Liberty Panelcrafters and RDL

### 2.3 GENERAL EQUIPMENT REQUIREMENTS:

- A. The equipment specified in this document aims to fulfill the intended functional requirements by precisely identifying the necessary equipment. Depending on the timing of component orders and the project timeline, there may be instances where certain equipment needs to be replaced with newer models. In the event that the indicated equipment is unavailable or has been replaced, the supplier or contractor shall provide a new model that offers comparable functionality.
- B. Loudspeakers:
  1. Provide applicable mounting equipment as needed, including but not limited to; back boxes, mounting hardware, safety equipment, and seismic restraints.
- C. Video Signal:
  1. The equipment listed below is considered to be equal replacement parts for a point-to-point video solution as it relates to the system design intent. Equipment listed in section 2.4 override the equipment listed below.
    - a. Cable Equalizer for cable lengths exceeding 30' but no more than 75' or that have more than two (2) union connections. Connect to external power supply and do not use the 5 volts within the HDMI cable.
      - i. Extron – HD 4K 101 Plus or Kramer – PT-3H2
    - b. Point to point HDBaseT extension, 18 Gbps, 4k60 4:4:4 at 100 Meters:
      - i. Crestron – DM-TX-4KZ-100-C-1G with DM-RMC-4KZ-100-C. or Extron – DTP2 T 211 with DTP2 R 211.
    - c. HDMI cables intended for client device connection and that are less than 15' shall be a flexible cable and support 18 Gbps, 4k60 4:4:4 for the entire length of the cable.
    - d. Equipment that is not preapproved by the AV Consultant in writing will not be accepted and will be replaced with the approved equipment at no cost to the Owner.
- D. Audio Signal:
  1. The equipment listed below is considered to be equal replacement parts for a point-to-point video solution as it relates to the system design intent. Equipment listed in section 2.4 override the equipment listed below.
    - a. Passive or Active audio summing adapter. Extron – ASA 131 or RDL – STA-1
    - b. Isolation transformer: RDL – EZ-HK1
- E. Cables grouped together shall be dressed in expandable nylon loom, similar to Techflex - Flexo
- F. Equipment Racks:
  1. All AV equipment racks within this specification shall have the following accessories and/or features, either rack mountable or built into the rack, depending on the model of the rack. Refer to bid documents for all rack mounted equipment.

Provide the following accessories as referred to in elevations. RUs are indicated in the elevations and noted with a # symbol in the part number.

2. General Equipment

- a. Shelving: Middle Atlantic – SS; 1RU shelf.
- b. Drawers:
  - i. Nonlocking: Middle Atlantic – D#
  - ii. Locking: Middle Atlantic – D#LK
- c. Header panel, located at the top of the rack, AV contractor to submit their logo to RCI for inclusion in the Header panel. If AV contractor has another company that makes the Header panel, provide that information to the AV Consultant.
  - i. RCI Custom – BNA001-200120MM-01
- d. Blank plates: Middle Atlantic – EB#
- e. Surge protection for all devices located within the rack. Surge protector shall be: 20 AMPs, rack mountable or mount to a side rail and at least 1,000 joules of protection.
  - i. Recommended Surge protector is Middle Atlantic – PD-920R-SP. Additional acceptable manufacturers are: Furman, Juice Goose, Triplite and SurgeX.
- f. Horizontal, vertical, and entry cable management.
  - i. All cabling shall be straight off of the back of equipment to horizontal supports connected to equipment rack. Cabling shall follow support to vertical supports when going into other components and/or out of the equipment rack.
  - ii. Cabling secured to other cabling and supported from the connector is not acceptable.
  - iii. Separate AC power and other signal types from each other.
- g. Provide 20 Amp rated power strips as necessary.
- h. Sequencers
  - i. Provide a Middle Atlantic – PDS-620R or Furman – CN-2400S Sequencer.
  - ii. All equipment racks with the following equipment shall have a sequencer within the equipment rack. AV integrator to follow industry standards when using sequencers.
    - 1. Amplifiers
    - 2. Video processors without control processors
- i. Active Thermal Management
  - i. Solid rear door.
  - ii. Fan kit totaling 190 CFM mounted on the top face of the equipment rack.
    - 1. Thermostatic fan controller (set temperature range between 80 degrees and 90 degrees Fahrenheit.
    - 2. Fan guards
    - 3. Recommend equipment are Middle Atlantic – QBP-2 Blower panel or Middle Atlantic – CAB-COOL50 Cabinet Cooler.
  - iii. Blank panels on the front of the equipment rack in all unused rack spaces.

- iv. Solid blank panels in unused rack spaces in top six (6) racks spaces.
- v. Stack power amplifiers with 1 open rack space between.
- vi. Provide active thermal management in the following equipment racks in the following systems.
  - 1. Gymnasium System
- j. Passive Thermal Management
  - i. Vented rear door with no less than 60% open area.
  - ii. Solid blank panels on the front of the rack in all unused rack spaces.
  - iii. Stack power amplifiers without open rack space between.
  - iv. Top of equipment cabinet to be open or vented.
  - v. Provide passive thermal management in all racks unless noted above.

**2.4 EQUIPMENT REQUIRED PER ROOM TYPE**

| <b>AV SYSTEMS PROGRAMMING</b> |   |                   |  |
|-------------------------------|---|-------------------|--|
| <b>TYPE</b>                   | <b>DESCRIPTION</b>  | <b>MANFR.</b>     | <b>MODEL NO.</b>                               |
|                               | AV SYSTEMS PROGRAMMING ALLOWANCE<br>REFER TO SECTION 3.3 FOR SCOPE OF PROGRAMMING | BNA<br>CONSULTING | \$3,600.00 SYSTEMS<br>PROGRAMMING<br>ALLOWANCE |
| <b>END OF SCHEDULE</b>        |   |                   |  |

| <b>CLASSROOM TYPE 1A EQUIPMENT SCHEDULE</b> |   |                      |  |
|---|---|----------------------|--|
| <b>TYPE</b>                                 | <b>DESCRIPTION</b>  | <b>MANFR.</b>        | <b>MODEL NO.</b>                                 |
| CSA   | CLASSROOM RF MICROPHONE SYSTEM,<br>RF RECEIVER, TEACHER & HANDHELD<br>MICROPHONE, LOUDSPEAKERS (C1)           | AUDIO<br>ENHANCEMENT | OPTIMUM SYSTEM<br>WITH XD RECEIVER<br>AND MS-600 |
| C1  | LOUDSPEAKER, 4", 1x2, CEILING<br>120 DEGREE COVERAGE  | AUDIO<br>ENHANCEMENT | FS-22  |
|   | CART, 86" NEWLINE DISPLAY AND BALANCE<br>BOX MOUNT TO BE OFCI   |                      | (OFCI)   |
| H   | FLAT PANEL ADJUSTABLE HEIGHT MOUNT,<br>MAX 250LBS LOAD, 1070 X 600 mm VESA,<br>LANDSCAPE (OFCI)               | BALANCEBOX           | 400 (OFCI)                                       |
| S86   | 86" INTERACTIVE DISPLAY (OFCI)  | OFCI                 | TT-8619RS (OFCI)                                 |
|   | ONE EACH CAT6A/7 NETWORK PATCH<br>CABLE, 15', WITH ADDITIONAL 15' 120V<br>POWER CABLE FOR 86" NEWLINE DISPLAY |                      |  |
| <b>END OF SCHEDULE</b>                      |   |                      |  |

| <b>CLASSROOM TYPE 2A EQUIPMENT SCHEDULE</b> |   |                      |                  |
|---|---|----------------------|------------------|
| <b>TYPE</b>                                 | <b>DESCRIPTION</b>  | <b>MANFR.</b>        | <b>MODEL NO.</b> |
| HDU   | HDMI, VGA, 3.5MM AUDIO AND USB PASS<br>THROUGH SINGLE GANG WALL PLATE | AUDIO<br>ENHANCEMENT | AV CONNECT 2     |

|                        |   |                   |  |
|------------------------|---|-------------------|--|
| CSA                    | CLASSROOM RF MICROPHONE SYSTEM, RF RECEIVER, TEACHER & HANDHELD MICROPHONE, LOUDSPEAKERS (C1) | AUDIO ENHANCEMENT | OPTIMUM SYSTEM WITH XD RECEIVER AND MS-600 |
| C1                     | LOUDSPEAKER, 4", 1x2, CEILING 120 DEGREE COVERAGE   | AUDIO ENHANCEMENT | FS-22                                      |
| H                      | FLAT PANEL ADJUSTABLE HEIGHT MOUNT, MAX 250LBS LOAD, 1070 X 600 mm VESA, LANDSCAPE (OFCI)     | BALANCEBOX        | 400 (OFCI)                                 |
| S86                    | 86" INTERACTIVE DISPLAY (OFCI)  | OFCI              | TT-8619RS (OFCI)                           |
| <b>END OF SCHEDULE</b> |   |                   |  |

| <b>MULTIPURPOSE ROOM EQUIPMENT SCHEDULE (1 OF 2)</b> |   |                     |  |
|--|---|---------------------|--|
| <b>TYPE</b>  | <b>DESCRIPTION</b>  | <b>MANFR.</b>       | <b>MODEL NO.</b>   |
| R3   | EQUIPMENT RACK, FLOOR SWING-OUT 91" TALL, 28" DEEP, 40 RU WITH VENTED FRONT DOOR  | MIDDLE ATLANTIC     | SR-40-28 W/ LVFD-40  |
|  | SHELF, PULL OUT, RACK MOUNT LATCHING, 1 RU  | MIDDLE ATLANTIC     | SS   |
|  | DRAWER, PULL OUT, RACK MOUNT LATCHING, 2 RU   | MIDDLE ATLANTIC     | D2   |
| TxH  | HDMI INPUT, WALL PLATE WITH DTP TRANSMITTER   | EXTRON              | DTP T HWP 4K 231 D   |
| Rx   | VIDEO RECEIVER, DTP   | EXTRON              | DTP HDMI 4K 230 RX   |
| AT   | DIVERSITY ARCHITECTURAL ANTENNA   | RF VENUE            | D-ARC WITH WALL HARDWARE MOUNTING KIT  |
| WMH  | WIRELESS HANDHELD MICROPHONE, WIRELESS RECEIVER KIT   | SHURE               | QLXD24/SM58<br>QTY: REFER TO PLANS   |
| WMB  | MICROPHONE, WIRELESS RECEIVER AND LAVALIER  | SHURE               | QLXD14/83<br>QTY: REFER TO PLANS   |
|  | ANTENNA DISTRIBUTION SYSTEM   | SHURE               | UA844+SWB  |
| ALS  | ASSISTED LISTENING WI-FI/ RF ADVANCED SYSTEM- 72 MHZ INCLUDING:<br>2-CHANNEL WI-FI SERVER<br>LE VENUE AWARENESS KIT<br>STATIONARY 3-CHANNEL TRANSMITTER PACK<br>DUAL RCA TO DUAL RCA CABLE<br>INTELLIGENT DSP RECEIVER (72MHz)<br>UNIVERSAL EAR SPEAKER<br>INTELLIGENT EAR PHONE/NECK LOOP<br>LANYARD<br>4 PORT USB CHARGER | LISTEN TECHNOLOGIES | LCS-121-01 INCLUDING:<br>(1) LW-100P-02<br>(1) LW-202<br>(1) LT-800-072-01<br>(1) LA304<br>(1) LA122 WITH LA326<br>(1) LPT-A107-B<br>(2) LR-4200-072<br>(2) LA-401<br>(2) LA-430<br>(1) LA-423 |
| BT   | AES-67/DANTE, 2-GANG WALL PLATE, WITH 4 CH INPUT, BLUETOOTH, L/R-RCA, L/R-3.5mm, 2 CH OUTPUT, L/R-3.5mm   | QSC                 | unD6IO-BT  |
| MXT  | AES-67/DANTE, 2-GANG WALL PLATE, WITH 4 CH INPUT, 2-XLR, L/R-RCA, L/R-3.5mm, 2 CH OUTPUT, L/R-3.5mm   | QSC                 | unD6IO   |
|  | NETWORK SWITCH, MANAGED, PoE++, 1440W<br>(24) 1GB AND 4SFP PORTS  | NETGEAR             | M4250-26G4F-POE++  |



|     |  |          |                      |
|-----|--|----------|----------------------|
| KP2 | KEYPAD, 6 CUSTOMIZABLE BUTTONS, BUS CONNECTION TO PROCESSOR                | EXTRON   | EBP 50               |
| KP1 | KEYPAD, PoE / IP, 4 BUTTON W/ DIGITAL LABELING AND VOLUME KNOB             | SYMETRIX | W3 WALL CONTROLLER   |
|     | VIDEO SWITCHER, 8 INPUT HDBaseT OUTPUT, SCALING W/ CONTROL PROCESSOR & AMP | EXTRON   | IN1608 xi IPCP MA 70 |

**END OF SCHEDULE**

**MULTIPURPOSE ROOM EQUIPMENT SCHEDULE (2 OF 2)**

| TYPE | DESCRIPTION   | MANFR.              | MODEL NO.  |
|------|---|---------------------|--|
|      | DIGITAL SIGNAL PROCESSOR<br>12 IN, 8 OUT, 8 IO, RS-232, DANTE   | SYMETRIX            | RADIUS NX 12X8   |
| 1E'  | POWER AMPLIFIER<br>2 CHANNEL X 100 WATTS, 70 V  | EXTRON              | XPA 1002 70V   |
|      | POWER AMPLIFIER<br>4 CHANNEL X 700 WATTS, 4 Ohms - 70/100V  | LEA<br>PROFESSIONAL | CONNECT 704  |
| P6   | LOUDSPEAKER, 6", PENDANT, HIGH CEILING<br>75 DEGREE COVERAGE  | JBL                 | CONTROL 67 HC/T<br>COLOR BY ARCHITECT                  |
| P10  | LOUDSPEAKER, 8", PENDANT<br>SUBWOOFER   | JBL                 | CONTROL 60 PS/T<br>COLOR BY ARCHITECT                  |
|      | PROJECTOR WALL MOUNTS AND<br>ACCESSORIES  | CHIEF               | WMA2S<br>VCMU<br>PG3A<br>CMS012S                       |
|      | PROJECTOR PROTECTIVE CAGE, STEEL<br>CONSTRUCTION, LOCKABLE<br>EQUIPMENT SIZE: 11" x 25" x 24"                                 | CHIEF               | PG3A   |
| P1   | 1-CHIP DLP, 10,000 lm, WUXGA, 1920X1200,<br>COLOR BY ARCHITECT  | PANASONIC           | PT-RZ990 WITH LENS<br>ET-DLE170                        |
| SC1  | CEILING MOUNTED, MOTORIZED, 16x10, 226"<br>(120" X 192") REAR PROJECTION SCREEN<br>MATERIAL, AV CONTROL SYSTEM<br>INTEGRATION | DRAPER              | ACCESS V<br>WITH LVC-IV CONTROLLER<br>CINEFLEX CH1200V |

**END OF SCHEDULE**

**CONFERENCE ROOM TYPE 1A EQUIPMENT SCHEDULE**

| TYPE | DESCRIPTION   | MANFR.               | MODEL NO.   |
|------|---|----------------------|---|
| HDU  | HDMI, VGA, 3.5MM AUDIO AND USB PASS<br>THROUGH SINGLE GANG WALL PLATE                                   | AUDIO<br>ENHANCEMENT | AV CONNECT 2  |
| TxM  | HDMI, VGA, 3.5MM AUDIO AND USB PASS<br>THROUGH SINGLE GANG WALL PLATE<br>W/UNDER TABLE MOUNTING BRACKET | AUDIO<br>ENHANCEMENT | AV CONNECT 2<br>PROVIDE UNDER TABLE<br>MOUNTING BRACKET |
| FB1  | FURNITURE BOX 1<br>SEE DRAWINGS FOR CONNECTIONS   | EXTRON               | CABLE CUBBY 202 (BLACK)                                 |
|      | FLAT PANEL TILT MOUNT, 14°, MAX 200LBS<br>LOAD, 878 X 500 mm VESA, LANDSCAPE                            | CHIEF                | LTM1U   |

|                        |   |         |         |
|------------------------|---|---------|---------|
|                        | FLAT PANEL TILT MOUNT, 14°, MAX 250LBS LOAD, 1070 X 600 mm VESA, LANDSCAPE  | CHIEF   | XTM1U   |
| D65                    | LCD, 65" DIAGONAL, UHD, 16/7 OPERATION, 350 NIT, 2-HD (HDCP 2.2), 1-DP, 2-USB, 1-LAN, RS-232, 400x400 VESA, PORTRAIT/LANDSCAPE, BUILT-IN WIFI | SAMSUNG | QB65R-B |
| D75                    | LCD, 75" DIAGONAL, UHD, 16/7 OPERATION, 350 NIT, 2-HD (HDCP 2.2), 1-DP, 2-USB, 1-LAN, RS-232, 400x400 VESA, PORTRAIT/LANDSCAPE, BUILT-IN WIFI | SAMSUNG | QB75R-B |
| <b>END OF SCHEDULE</b> |   |         |         |

| <b>CONFERENCE ROOM TYPE 2A EQUIPMENT SCHEDULE</b> |   |                   |   |
|---|---|-------------------|---|
| <b>TYPE</b>                                       | <b>DESCRIPTION</b>  | <b>MANFR.</b>     | <b>MODEL NO.</b>                                  |
| HDU   | HDMI, VGA, 3.5MM AUDIO AND USB PASS THROUGH SINGLE GANG WALL PLATE  | AUDIO ENHANCEMENT | AV CONNECT 2                                      |
| TxM   | HDMI, VGA, 3.5MM AUDIO AND USB PASS THROUGH SINGLE GANG WALL PLATE W/UNDER TABLE MOUNTING BRACKET   | AUDIO ENHANCEMENT | AV CONNECT 2 PROVIDE UNDER TABLE MOUNTING BRACKET |
|   | FLAT PANEL TILT MOUNT, 14°, MAX 125LBS LOAD, 650 X 400 mm VESA, LANDSCAPE   | CHIEF             | MTM1U   |
|   | FLAT PANEL TILT MOUNT, 14°, MAX 200LBS LOAD, 878 X 500 mm VESA, LANDSCAPE   | CHIEF             | LTM1U   |
| D50   | LCD, 50" DIAGONAL, UHD, 16/7 OPERATION, 350 NIT, 2-HD (HDCP 2.2), 1-DP, 2-USB, 1-LAN, RS-232, 200x200 VESA, PORTRAIT/LANDSCAPE, BUILT-IN WIFI | SAMSUNG           | QB50R-B   |
| D55   | LCD, 55" DIAGONAL, UHD, 16/7 OPERATION, 350 NIT, 2-HD (HDCP 2.2), 1-DP, 2-USB, 1-LAN, RS-232, 200x200 VESA, PORTRAIT/LANDSCAPE, BUILT-IN WIFI | SAMSUNG           | QB55R-N   |
| S55   | 55" INTERACTIVE DISPLAY (OFCI)  | OFCI              | OFCI  |
|   | WALL-MOUNT (OFCI)   | OFCI              | OFCI  |
| <b>END OF SCHEDULE</b>                            |   |                   |   |

| <b>BUILDING EQUIPMENT SCHEDULE</b> |   |                     |  |
|------------------------------------|---|---------------------|--|
| <b>TYPE</b>                        | <b>DESCRIPTION</b>  | <b>MANFR.</b>       | <b>MODEL NO.</b>   |
| HDU                                | HDMI, VGA, 3.5MM AUDIO AND USB PASS THROUGH SINGLE GANG WALL PLATE        | AUDIO ENHANCEMENT   | AV CONNECT 2   |
|                                    | 16 UNIT DOCKING STATION   | LISTEN TECHNOLOGIES | DOCKING STATION 16 LA-480-01 (PROVIDE QTY. TO MEET ADA RULE BASED ON VERIFIED OCCUPANCY) |
|                                    | FLAT PANEL TILT MOUNT, 14°, MAX 125LBS LOAD, 650 X 400 mm VESA, LANDSCAPE | CHIEF               | MTM1U  |
|                                    | FLAT PANEL TILT MOUNT, 14°, MAX 200LBS LOAD, 878 X 500 mm VESA, LANDSCAPE | CHIEF               | LTM1U  |

|                        |   |                      |         |
|------------------------|---|----------------------|---------|
| D50                    | LCD, 50" DIAGONAL, UHD, 16/7 OPERATION, 350 NIT, 2-HD (HDCP 2.2), 1-DP, 2-USB, 1-LAN, RS-232, 200x200 VESA, PORTRAIT/LANDSCAPE, BUILT-IN WIFI | SAMSUNG              | QB50R-B |
| D55                    | LCD, 55" DIAGONAL, UHD, 16/7 OPERATION, 350 NIT, 2-HD (HDCP 2.2), 1-DP, 2-USB, 1-LAN, RS-232, 200x200 VESA, PORTRAIT/LANDSCAPE, BUILT-IN WIFI | SAMSUNG              | QB55R-N |
| D65                    | LCD, 65" DIAGONAL, UHD, 16/7 OPERATION, 350 NIT, 2-HD (HDCP 2.2), 1-DP, 2-USB, 1-LAN, RS-232, 400x400 VESA, PORTRAIT/LANDSCAPE, BUILT-IN WIFI | SAMSUNG              | QB65R-B |
|                        | DIGITAL SIGNAGE PLAYER (OFCI)   |                      |         |
| MB                     | COUNTER TOP TICKET WINDOW INTERCOM SYSTEM. 15" GOOSENECK, ON/OFF SWITCH, AND VOLUME CONTROL   | ALPHA COMMUNICATIONS | DC-300  |
| <b>END OF SCHEDULE</b> |   |                      |         |

### PART 3 – EXECUTION

#### 3.1 INSTALLATION OF AV SYSTEMS:

- A. Provide AV systems and ancillary equipment as indicated on drawings and in accordance with equipment manufacturer's written instructions, the NEC, and with industry best practices.
- B. Coordinate all work performed by other contractors pertaining to the AV system, including raceways, electrical boxes and fittings.
- C. Video systems.
  1. HDCP:
    - a. All equipment within the signal path must be capable of processing HDCP-compliant material.
    - b. All switcher, scalers, transmitters, and receivers shall reflect the HDCP compliance of the endpoint/display(s).
    - c. HDCP shall be disabled in the switcher/scaler when a non-HDCP-compliant endpoint/display is used.
  2. EDID Strategy:
    - a. Permanent video sources shall be set manually within the equipment to output their native resolution. Video properties shall not rely on EDID.
    - b. Portable video sources and wall plates shall use EDID tables within the switcher/scaler for preferred video properties. The EDID table shall be set with the following settings:
      - i. Gym system
        1. 1920 x 1200 (WUXGA) 60Hz
      - ii. Building Digital signage and fixed flat panels
        1. 3840 x 2160 (UHD) 30Hz, 4:4:4 Chroma sample
      - iii. Audio: refer to control section for audio requirements. This will include mono, Stereo, Surround sound, etc.. All audio will be 44,100 Hz, 16 bit unless otherwise noted.

D. Pathway Requirements:

1. General:

- a. All pathways shall be designed, constructed, grounded and installed in accordance with all recommendations delineated within TIA 569-B and Standard TIA 942.
- b. Prior to placing any cable pathways or cable, the contractor shall survey the site to determine job conditions will not impose any obstructions that would interfere with the safe and satisfactory placement of the cables. Field coordinate alternate pathway requirements with other trades onsite. New pathways shall not exceed distance limitations defined within this specification. Notify the Engineer of the changes for final approval prior to proceeding with the change.

2. Conduits:

- a. Contractor shall provide a minimum of 1-1" EMT conduit from device to accessible ceiling space unless otherwise noted. Then utilize non-continuous cable support from devices to connecting device. Refer to AV symbol schedule for specific conduit requirements.
  - i. Provide non-continuous open top cable supports every 5' above accessible ceiling.
- b. Provide conduit from device to device in open and/or exposed ceilings. Ceilings with clouds are considered open/exposed ceiling.
- c. Achieve the best direct route parallel with building lines with no single bend greater than 90 degrees or an aggregate of bends in excess of 180 degrees between pull points or pull boxes.
- d. Provide large radius elbows on all bends.
- e. Conduit runs shall not have continuous sections longer than 100 feet without a pull box. Refer to rough-in schedule for conduit fill capacity.
- f. AV conduits should not be routed over or adjacent to heat sources such as boilers, hot water lines, or steam lines. Neither should they be routed near large motors, generators, photocopy equipment, or electrical power cabling and transformers.
- g. After installation, conduits shall be clean, dry, unobstructed, capped for protection, labeled for identification, reamed and fitted with bushings.
- h. A 200lb pull cord (nylon, 1/8" minimum) shall be installed in any empty conduit.

3. Open Top Cable Support Requirements:

- a. Non-continuous cable supports shall provide a bearing surface of sufficient width to comply with required bend radii of high-performance cables
- b. Non-continuous cable supports shall have flared edges to prevent damage while installing cables.

4. Pull Box Requirements:

- a. NEC sized pull boxes are not acceptable. Follow BICSI and EIA/TIA 569-B guidelines for pull box sizing.
- b. Provide pull boxes in sections of conduit that are 100 feet or longer, contain more than two 90 degree bends, or contain a reverse bend.
- c. Conduits that enter a pull box from opposite ends should be aligned.

- d. Pull boxes shall have a length 12 times the diameter of the largest conduit.
- e. All pull boxes must be accessible.

E. Cabling System:

1. Follow T568B scheme for copper category cabling terminations.
2. Provide a minimum 6" service loop in each AV system junction box. Cables shall be coiled in the in-wall boxes if adequate space is present to house the cable coil without exceeding manufacturers bend radius.
3. In a false ceiling environment, a minimum of 3 inches shall be maintained between cable supports and false ceiling. At no point shall cable(s) rest on lay-in ceiling grids or panels.
4. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
5. Cables shall not be attached to ceiling grid seismic support wires or lighting fixture seismic support wires. Where support for AV cable is required, the contractor shall install appropriate carriers to support the cabling.
6. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to the Owner.
7. Pulling tension for balanced twisted pair shall not exceed 25lbf and for optical fiber shall not exceed 50lbf.
8. Pair untwist at the termination shall not exceed 0.125". The cable jacket shall be maintained as close as possible to the termination point.
9. Cable shall not be draped on, tied or otherwise secured to electrical conduit, plumbing, ventilation ductwork or any other equipment. Cable shall be secured to building supports or hangers or to additional blocks or anchors specifically installed for this purpose.
10. Group multiple cabling together with expandable nylon loom, similar to Techflex - Flexo, when cabling exists a cavity and connects to a device. Cabling within a lectern, podium or millwork shall have expandable nylon loom sleeve as well.
11. Cabling shall not be spliced anywhere in the cable pathway. Acceptable connections/terminations are solder from cable to device, mechanical screw compression into equipment (ie. Euro block, phoenix connector, etc.), or if noted a patch panel/terminal block.

F. Grounding System:

1. All grounding and bonding shall be done according to ANSI J-STD-607-A, TIA 942, and NEC.
2. All cabinets/racks shall utilize paint piercing grounding washers, to be used where rack sections bolt together, on both sides, under the head of the bolt and between the nut and rack.
3. All racks shall further utilize a full-length rack ground strip attached to the rear of the side rail with the thread-forming screws provided to ensure metal-to-metal contact. Similar to Panduit RGS.
4. All active equipment shall be bonded to ground. If the equipment manufacturer provides a location for mounting a grounding connection, that connection shall be utilized. All active equipment shall be bonded using the appropriate jumper for the equipment being installed using the thread-forming screws. Similar to Panduit RG.

5. Racks shall have individual, appropriately sized conductors bonded to the grounding backbone. Do not bond racks or cabinets serially – daisy-chained rack grounds will not be accepted.
  6. Refer to electrical diagrams for additional ground connection requirements.
- G. Cabling groups and conduit separation:
1. Refer to “CABLING GROUPS AND CONDUIT SEPARATION SCHEDULE”, located on the drawings
- H. Firmly secure all equipment in place that is not intended for portability.
- I. Mount projectors permanently and provide mechanical index ensuring precise alignment of the projected image.
- J. Provide adequate structural support for AV system components. Provide fastenings and supports with a safety load factor of at least five.
- K. Digital Signage:
1. AV Contractor shall be responsible for installing the device(s) as indicated on the drawings and in the specifications.
  2. AV Contractor shall be responsible for the following related to Digital Signage:
    - a. Submit an RFI asking for Color, Logo, IP scheme and other information related to setup and installation of digital signage players. Any passwords that are shared are to be changed immediately after setup is configured.
    - b. Verifying connection to owner's account
    - c. Training owner on connecting, setup and uploading content to device(s).
    - d. Create one (1) page of content for the owner per location indicated below. The page must include:
      - i. Owner's Logo in the top left corner and in their color scheme and fonts.
      - ii. A block that is 1/3 of the right side of the display for company announcements. This location should read “welcome to” building name.

### 3.2 LABELING

- A. The contractor shall develop and submit for approval a labeling system for the cable installation. The Owner will negotiate an appropriate labeling scheme with the contractor. At a minimum, the labeling system shall clearly identify all components of the system: racks, cables, panels and wall plates. The labeling system shall designate the cables origin and destination and a unique identifier for the cable within the system. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme.
- B. All AV pathways, cables, connecting hardware, equipment, racks, patch panels, outlet/connectors, and grounding system shall be labeled in accordance with TIA/EIA 606-A.
- C. All labels shall meet UL 969 requirements for legibility, defacement and adhesion requirements. Handwritten, Ink, or Laser Printing labels are not allowed. Labels shall be uniform in physical size and text height with minimal blank space. Provide labels using thermal transfer print. Heat shrinking or wraparound labels are required, flag style labels are not allowed.
- D. Provide laminated plans (minimum size 11x17) of all AV as-built plans (including one-line diagrams) in each and every AV Rack.
- E. Label each equipment with the date (month/year) that it was installed along with the IP

address, if applicable, and equipment type.

### 3.3 CONTROL SYSTEM FUNCTIONALITY:

#### A. GENERAL:

1. The control processing and digital signal processing programming required for AV sub-systems as defined in section 2.4 of this specification shall be completed by BNA Consulting.
  - a. The General AV sub-systems require configuration and are not included in BNA's programming scope of work.
  - b. Configuring of system components will be part of the Contractors scope of work. Contractor shall provide IP address, MAC address, Serial numbers, etc to BNA for coordination with the program.
  - c. IP address will be coordinated by the programmer and shared with contractor for implementation into specific devices.
2. The successful bidder for this specification section (27 4100) shall contract BNA Consulting for performance AV programming services.
  - a. The allowance defined in section 2.4 for the performance AV systems programming services shall be included in the bid as a line item.
  - b. Contracting shall take place once shop drawings are submitted. The Programming phase shall begin upon final approval of AV contractor shop drawings.
3. Control programs & DSP configuration programs shall be designed to match the schematic system wiring as shown in approved shop drawings.
4. The AV contractor must field wire each system in accordance with the final approved shop drawings.
  - a. Any deviations made to shop approved shop drawings will be subject to additional programming service fees.
5. Before programming services commence, the AV contractor shall confirm that all connections are complete, and all equipment is powered up and functional.
  - a. Written documentation including site progress photos shall be provided to BNA Consulting prior to commencement of the programming phase.

#### B. CONTRACTOR SCOPE OF WORK:

1. Configuration:
  - a. The following is expected to be complete prior to implementation of the program. Testing of the system settings shall be confirmed by the installer.
  - b. Component Configuration requirements:
    - i. Setup wizard is complete and ready for functionality.
    - ii. Image set to Dot to Dot and aligned with the screen surface.
    - iii. Device controls are set as identified in the signal flows ie: RS-232, IR, Relay, Contact, or IP controls.
    - iv. Limit settings on screens, shades, etc..
    - v. Turning off ECO mode.
    - vi. Dip switches, dials, and manual settings on devices.
    - vii. Device network settings, IP Static/DHCP, Domain, Subnet, etc.

1. These will be provided by the programmer for the AV installer to configure prior to implementation of the program.
  2. Network connection and power for devices are expected to be ready for testing.
- viii. Configuration of the Controller processor/controlling device will be by the AV programmer in the AV installers local facility.
- c. Coordinate with the programmer on programming testing prior to installation.
- C. PROGRAMMER SCOPE OF WORK:
1. Configuration:
    - a. Network switch
    - b. Control Processor and devices with a fully functional controller
    - c. DSP
    - d. Touch panel / keypad
- D. ROOM FUNCTIONS:
1. Classroom Type 1A
    - a. Room will have portable AV cart with interactive display and adjustable height mount, all owner furnished, contractor installed. The only connections from AV cart are 15' network data cable, and power cable provided by Integrator.
    - b. Room has Audio Enhancement voice reinforcement through teacher's lanyard microphone and handheld microphone. Four ceiling Loudspeakers are provided in each room.
    - c. Room has 'Call' panel next to door for Call / Paging / Emergency functions.
  2. Classroom Type 2A
    - a. Room has 86" Interactive display mounted on wall with vertically adjustable mount. Both display and mount are OFCI. Display is accessed through HDU device that provides HDMI, USB, and audio input.
    - b. Owner requires that receiver of HDU device be mounted in an accessible location behind the top, left side (as facing the display) of the interactive display.
    - c. Room has Audio Enhancement voice reinforcement through teacher's lanyard microphone and handheld microphone. Four ceiling speakers are provided in each room.
    - d. Room has 'Call' panel next to door for Call / Paging / Emergency functions.
  3. Multipurpose Room controls / functionality
    - a. All inputs and outputs shall be coordinated with AV riser diagram.
    - b. Inputs assigned for the East area shall be mixed in that area unless the rooms are combined.
    - c. Inputs assigned to the West area shall be mixed in that area unless the rooms are combined.
    - d. 'KP1' Button controls:
      - i. Button 1: reads: "WEST GYM VOL"



1. When selected it will adjust the volume for that area.
2. Only label all keypads
- ii. Button 2: reads: "EAST GYM VOL"
  1. When selected it will adjust the volume for that area.
  2. Only label keypads in enclosure C10b and KP1 on stage
- iii. Button 3: reads: "STAGE VOL"
  1. When selected it will adjust the volume for that area.
  2. Only label keypads in enclosure C10b and KP1 on stage
- iv. Button 4: reads: "OVER ALL GYM VOL"
  1. When in combined mode this button will lower the entire volume in the room.
  2. Only label keypads in enclosure C10b and KP1 on stage
- v. Knob adjusts the output level on the DSP, disable the push feature on the knob.
- e. 'KP2' Button controls
  - i. Button 1a reads: "PROJECTOR ON"
    1. Power on the projector.
    2. Lower the screen.
  - ii. Button 1b reads: "STAGE LEFT HDMI"
    1. Switches the video input to this input.
  - iii. Button 1c reads: "RACK INPUT 1"
    1. Switches the video input to this input.
  - iv. Button 2a reads: "PROJECTOR OFF"
    1. Power off the projector.
    2. Raises the screen.
  - v. Button 2b reads: "STAGE RIGHT HDMI"
    1. Switches the video input to this input.
  - vi. Button 2c reads: "RACK INPUT 1"
    1. Switches the video input to this input.
4. Conference Room Type 1A
  - a. Wall mounted display on tilt capable mount will be accessed through 'HDU' device located in table top recessed enclosure. 'HDU' provides HDMI, USB, and audio input to display.
5. Conference Room Type 2A
  - a. Wall mounted interactive display on will be accessed through 'HDU' device located next to or directly under the display. 'HDU' provides HDMI, USB, and audio input to display.
  - b. Room has 'Call' panel next to door for Call / Paging / Emergency functions.
6. Media Center

- a. Media Center shall have Audio Enhancement voice amplification from teacher's lanyard microphone or handheld wireless microphone. Four loudspeakers are located over tables in Northwest corner of room.
- b. Room will have portable AV cart with interactive display and adjustable height mount, all owner furnished, contractor installed. The only connections from AV cart are 15' network data cable, and power cable provided by Integrator.
- c. 65" Display behind Library 'checkout' desk is accessed through 'HDU' device mounted in desk. 'HDU' provides HDMI, USB, and audio input to display. 'HDU' device is OFCI
- d. Room has 'Call' located behind 'checkout' desk for Call / Paging / Emergency functions.

7. Building Equipment

- a. Building Intercom system shall be Audio Enhancement Epic system capable of announcements, paging, bell system, emergency to a variety of zones as defined on project plans. Loudspeakers are located in all necessary rooms, and on outside walls for complete building and property coverage of announcements.
- b. Two 65" displays will have digital signage devices that are OFCI. One display is located in main office reception area. Second display is in main East-West hallway, lower level, outside Multipurpose room doors.

8. Collaboration Areas

- a. Collaboration areas shall have Audio Enhancement voice amplification from dedicated teacher's lanyard microphone or handheld wireless microphone. Loudspeakers, powered by dedicated amplifier located in ceiling equipment rack are located to provide adequate audio coverage of collaboration area.
- b. Collaboration areas will have portable AV cart with interactive display and adjustable height mount, all owner furnished, contractor installed. The only connections from AV cart are 15' network data cable, and power cable provided by Integrator.

9. Refer to drawings for keypad layouts, button callouts and description of system intent.

10. All room controls are required to have the similar looks and functionality.

E. Amplifiers shall be set to go to stand by after 30 minutes of no audio detection.

### 3.4 CYBER SECURITY

A. Contractor shall change all default username and passwords for all network devices provided. A Strong Password should include at a minimum the following:

- 1. Be at least 12 characters in length
- 2. Contain both upper and lowercase alphabetic characters (e.g. A-Z, a-z)
- 3. Have at least one numerical character (e.g. 0-9)
- 4. Have at least one special character (e.g. ~!@#\$%^&\*()\_-=)
- 5. Cannot contain full words

B. No written username or passwords shall be located in any areas of installation.

C. Network devices to be set up on a separate network other than owner's LAN ensuring no internal or external users can access system without authorization.

- D. Follow manufacturers hardening guide and use best industry practices to secure network and devices provided by contractor and associated with system.

### 3.5 FIELD QUALITY CONTROL:

#### A. TESTING:

1. Refer to "INTEGRATOR VERIFICATION CHECKLIST" at the end of this section, for system verification requirements. Verification checklist shall be complete prior to final commissioning.
2. Upon completion of installation of each system and after electrical circuitry has been energized, demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units on site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with testing.
3. Before inspection by owner and AV Consultant, and after completion of the installation, conduct system tests and make necessary corrections for proper system operation.
4. Adjust, balance and align equipment for optimum quality and to meet the manufacturer's published specifications.
5. All limiters and/or compressors shall be set to prevent operators from over-adjusting sound levels and damaging system components, while maintaining the highest amount of gain possible.
6. System shall have no audible hum, noise, RFI, or distortion when operating under normal conditions. System shall reproduce material at the loudspeakers rated output level without audible distortion. All input levels shall be pre-set so system may be operated without causing unstable feedback under normal use.
7. System shall have no image distortion, hum bars, color shift, or any other picture distortion while operating under normal conditions. Provide cable equalizers or an HDBaseT video solution. Cable equalizer shall be located near display and powered, on all cables that are more than 30 feet in length or with more than four (4) connection points. Refer to section 2.3.B in this specification for a list of pre-approved equipment. Adjust gain controls for optimum signal-to-noise with 0 dBu at a line-level input.
8. Perform polarity checks of loudspeaker lines by means of a polarity tester or use DC source at one end of each line and a voltmeter at the other end. Loudspeaker lines shall be identically polarized with respect to color coding.
9. Loose parts and poor workmanship or soldering shall be replaced.
10. Sweep Loudspeaker systems with high-level sine wave or 1/3 octave pink noise source. Correct causes of buzzes or rattles related to Loudspeakers or enclosures. Notify owner of external causes of buzzes or rattles.
11. Equalize the loudspeakers to produce less than 6 dB total variation between 500 Hz and 8000 Hz (+/- 3 dB).
12. Contractor shall provide system testing as described herein using up-to-date and industry accepted test equipment appropriate to the types of links being tested and in accordance with the latest edition of IEC 61935-1. AV Contractor shall own and have access to a handheld Quantum Data 780C tester to allow for on-site verification testing and troubleshooting of HDMI and digital video networks and analog video displays. All test equipment used shall be factory calibrated within one year of use with references set daily prior to testing.
13. Contractor shall provide HDCP compliant device with digital cables, and digital HDCP content for testing of routing and HDCP compliant distribution and

switching.

14. Horizontal cabling contractor shall test all twisted pair cabling used within the AV system following the standards in specification 27 1500 under the testing section. Provide documentation of testing to AV Consultant prior to final walk through.
- B. At the time of final commissioning, if the AV consultant determines that the systems are not sufficiently complete to do a final punch list, and was not notified at least three (3) days prior to the visit, then a return visit will be required. The AV Consultant's return visit will be paid for in advance by the AV integrator at a flat rate of \$1,000 per person, at no cost to the owner.

**3.6 OPERATING AND MAINTENANCE MANUALS: Refer to Section 26 0502 for requirements.**

**3.7 TRAINING:**

- A. Provide four (4) sessions of two (2) hours each of training on the operation of each system, at job site, at no cost to owner. Systems shall be complete and have been finalized by the AV Consultant prior to training.
- B. Training shall be recorded using a video recording device that support a minimum resolution of 1080P/60 with an integrated microphone connection for an external microphone and a camera tri-pod mount. Presenter shall be wearing a lapel microphone that connects to the recording device and a Tri-pod shall be used for stabilizing the recording device. Recordings that are shaky, poor audio and/or video quality, incomplete, or other issues will not be accepted and the contractor will be responsible for providing a new recording and training within five (5) business days of notification. Provide a digital copy, in MP4 format, on a USB flash drive to the Owner and AV Consultant. Also locate a USB flash drive with the training videos, programing, etc. in the as-built drawer of the main equipment rack. Digital copies sent as a link are not acceptable. identify within the Operating and Maintenance manuals, in the first section, where the flash drive is stored. Clearly label the flash drive as training videos. The second training shall take place within a month of the first training and all questions shall be answered.
- C. Contractor shall be present at the first performance using the system within rooms listed below. Owner will coordinate with contractor 3 weeks in advance for personal trained on the system to help with the show and be onsite in case there are any problems. AV Contractor to provide this within his bid.
  1. Multipurpose room

**3.8 RECORD DRAWINGS: Refer to Section 26 0502 for requirements.**

**END OF SECTION 27 4100**

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# BNACONSULTING

## Audio Performance

| Title                     | Description   | Initial | Notes |
|---------------------------|---|---------|-------|
| Audio Signal Distribution | Verify that audio signal is being transported and distributed according to project documentation.   |         |       |
| Phantom Power             | Verify that the correct phantom power is provided at the correct locations according to project documentation.  |         |       |
| Gain Before Feedback      | Verify that the audio system is capable of reproducing speech above nominal operating levels without audible distortion or feedback.  |         |       |
| Rough Balance (input)     | Verify that all inputs have the same nominal level.   |         |       |
| Gain Structure            | Verify that proper gain structure has been followed from each input to output   |         |       |
| Rough EQ                  | In systems with equalization capability, equalize the loudspeakers to produce less than 6 dB total variation between 500 Hz and 8000 Hz (+/- 3 dB).                         |         |       |
| DSP Programming           | Verify that DSP systems have been programmed to allow signal routing, balance, and EQ. DSP programming should be saved in editable form prior to final commissioning visit. |         |       |
| Rough Balance (output)    | Verify that loudspeaker zones reproduce program content at the same level (+/- 1 dB).   |         |       |
| Emergency Muting          | Verify that any required muting or operational changes are in accordance with location regulations in the event of a life safety or similar emergency.                      |         |       |
| Assistive Listening       | Verify that the assistive listening system functions as a complete personal listening system at specified levels without distortion or excessive background noise.          |         |       |
| Loudspeakers              | Verify that there is no hum, noise, RFI, or distortion when operating under normal conditions.  |         |       |
| Loudspeakers              | Verify that there are no rattles or buzzes with a high-level sign wave or 1/3 octave pink noise.  |         |       |
| Loudspeaker Zoning        | Verify that loudspeaker zones are assigned correctly according to project drawings and specifications.  |         |       |
| Loudspeaker Impedance     | Verify that all loudspeaker circuits have correct impedance as defined in the project drawings and specifications. Note measured impedance on previous page.                |         |       |



# BNACONSULTING

|                          |   |  |  |
|--------------------------|---|--|--|
| Loudspeaker Alignment    | Verify that loudspeakers are mounted and aligned as shown in project documentation.                           |  |  |
| Loudspeaker Polarity     | Verify that all loudspeakers in a given space are wired with the same polarity.                               |  |  |
| Loudspeaker Tap Settings | Verify the tap settings on all constant voltage loudspeakers.   |  |  |
| Loudspeaker Delays       | Verify that loudspeakers are set with the proper delay. Refer to drawings and specifications for requirements |  |  |

## General Items

| Title                | Description   | Initial | Notes |
|----------------------|---|---------|-------|
| Labeling             | Verify that all cabling, equipment, and wall plates are labeled per specifications and as noted on drawings                                       |         |       |
| Cable management     | Verify that proper cable management has been provided and that everything looks well-ordered.   |         |       |
| Power                | Verify that power supplies are secured and in an accessible area.   |         |       |
| Sequencer            | Verify that the sequencer(s) are setup correctly for industry standard power on/off function.   |         |       |
| Cyber Security       | Verify that all default passwords have been changed. Provide all login information to the owner representative                                    |         |       |
| System testing       | Verify that all systems have been tested and are in working order.  |         |       |
| System Certification | Verify system has been tested with industry standard testing equipment including the use of Quantum Data 780C                                     |         |       |
| Cabling              | Verify that all cabling on the project meets the document requirements.   |         |       |
| Network              | Verify that the owner has all of the needed information for all devices on the network. Provide this information to the owner via a spread sheet. |         |       |
| Network              | Verify that all IP address are within the owner's network scheme.   |         |       |
| Network              | Verify that VLANS are setup as indicated in drawings and within owner's network infrastructure  |         |       |
| System One-lines     | Verify that each equipment rack contains a set of one-lines diagrams for system installed. Refer to specifications for one-line requirements.     |         |       |
| Thermal Management   | Verify active thermal management is setup correctly and working properly.   |         |       |
| Training             | Verify training has been scheduled with the owner representative.   |         |       |

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## Control System Performance

| Title              | Description  | Initial | Notes |
|--------------------|--|---------|-------|
| Functionality      | Verify that the control system functions according to project documents.   |         |       |
| Automatic controls | Verify that the automatic features work ie: room combining, video detection, etc..   |         |       |
| Lighting controls  | Verify that the lighting system presents are correctly recalled by the control system as indicated in project documents.                                       |         |       |
| Shade controls     | Verify that the shade controls are correctly recalled by the control system as indicated in project documents.   |         |       |
| Sequencer          | Verify the sequencer is controlled as noted in project documents. If no specific requirements are noted, sequencer will be powered on/of from the front panel. |         |       |

## Video Performance

| Title                     | Description  | Initial | Notes |
|---------------------------|--|---------|-------|
| Video Routing & Switching | Verify that all video signals are properly routed, switched, scaled, and displayed according to project documents.   |         |       |
| Projector Alignment       | Verify that projectors and screens provide a projected image that is properly aligned and fills the projection area.   |         |       |
| Projector Alignment       | Verify that projector and screen are in the correct locations, correctly aligned and keystone correction is not in use.  |         |       |
| Projector Interactivity   | Verify that projector touch sensors are calibrated and working per manufacture instructions. Provide offset hardware as needed.  |         |       |
| Image Scaling             | Verify that all displayed images are scaled to the full native resolution of displays and projectors in all cases where scaling hardware is specified.                       |         |       |
| Image Quality             | Verify that all displayed images are correctly focused and are free from distortion.   |         |       |
| Aspect Ratio              | Verify that all displayed images maintain the proper aspect ratio and image geometry. Key-stoning and stretching should not be used. Any exceptions to this should be noted. |         |       |
| Display Image setting     | Displays are set to dot to dot or full. Images shall fill the screen without cropping.   |         |       |
| Signal Bandwidth          | Verify that all equipment from endpoint to endpoint supports the   |         |       |

# BNA CONSULTING

|                      |   |  |  |
|----------------------|---|--|--|
|                      | resolution/data rate as indicated in the documents.   |  |  |
| System Certification | Verify system has been tested with industry standard testing equipment including the use of Quantum Data 780C |  |  |

# Memorandum

To: Breanna Bonsavage  
VCBO

From: Eric Mangum

Date: December 6, 2023

Re: ASI 3; OSD Hillcrest Elementary AV Equipment Schedule Clarification

Add the following equipment schedule To Specification 27 4100 Audiovisual:

## Section 2.4 EQUIPMENT REQUIRED PER ROOM TYPE

| COLLABORTATION AREA EQUIPMENT SCHEDULE |   |                      |  |
|--|---|----------------------|--|
| TYPE                                   | DESCRIPTION   | MANFR.               | MODEL NO.  |
| R2                                     | 2X2 EQUIPMENT RACK, ABOVE CEILING<br>2 RU, RECESSED   | CHIEF                | CMS492   |
| CSA                                    | CLASSROOM RF MICROPHONE SYSTEM,<br>RF RECEIVER, TEACHER & HANDHELD<br>MICROPHONE, LOUDSPEAKERS (C1)           | AUDIO<br>ENHANCEMENT | OPTIMUM SYSTEM<br>WITH XD RECEIVER<br>AND MS-600 |
|  | POWER AMPLIFIER<br>1 CHANNEL X 200 WATTS, 70/100V   | EXTRON               | XPA 2001   |
| C4                                     | LOUDSPEAKER, 6", CEILING, LOW PROFILE<br>120 DEGREE COVERAGE  | JBL                  | CONTROL 47LP                                     |
|  | CART, 86" NEWLINE DISPLAY AND BALANCE<br>BOX MOUNT TO BE OFCI   |                      | (OFCI)   |
| S86                                    | 86" INTERACTIVE DISPLAY (OFCI)  | OFCI                 | TT-8619RS (OFCI)                                 |
|  | ONE EACH CAT6A/7 NETWORK PATCH<br>CABLE, 15', WITH ADDITIONAL 15' 120V<br>POWER CABLE FOR 86" NEWLINE DISPLAY |                      |  |
| <b>END OF SCHEDULE</b>                 |   |                      |  |

End of Memorandum.

## SECTION 27 5123

### INTERCOMMUNICATION SYSTEMS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26, 27 & 28 basic materials and methods sections apply to work specified in this section.
- C. Refer to specification 27 1500 for category and/or optical fiber cable and connectivity specifications and color requirements. Category cables used for transporting video, audio and controls simultaneously from transmitters to receivers and/or switchers shall follow manufacturer's recommend cabling specifications, refer to manufacturer for requirements.
  - 1. Fiber Optic Cable: Fiber optic cable is the designated media cabling for school backbone inter-building and intra-building wiring. This includes all MDF to IDF or IDF to IDF and vertical riser applications.
  - 2. Copper Cable: Unshielded Twisted Pair (UTP) with the specified category cabling must be used for the horizontal wiring from the MDF, IDF, or CP to the individual communications outlets.
  - 3. Rack and PoE Switches Requirement: low voltage contractor is responsible for equipment racks, and/or communications cabinets. The racks must be installed in the MDF and IDFs to support communications systems equipment and the communications distribution system and must match the current School District Standard. Communications distribution cables must be terminated in jackfields and punch-down blocks mounted in the equipment racks or communications cabinets.
  - 4. All intercom cabling shall be installed by division 27 1500 contractor. Coordinate pathways as required.

##### 1.2 ADMINISTRATIVE REQUIREMENTS:

- A. Bid Submittal:
  - 1. Equipment Costs: Breakout cost of material and labor as different line items.
  - 2. Provide separate line items for each section that you are being bid on.
    - a. Contractor shall not provide a single number with all of the sections/scopes combined.
- B. All bids shall be based on the expansion of the existing district's Intercommunication and Bell Schedule Server Systems and must be compatible with the existing Rauland-Borg Systems - No Exceptions. Equipment as specified herein. The catalog numbers and model designations are that of the RAULAND BORG CORPORATION.
- C. Coordination:
  - 1. Coordinate final inspection of the systems installed, with the intercommunications system design consultant, three (3) weeks in advance.

2. Obtain GANTT chart for construction time frame from the General Contractor.
3. Coordinate with Electrical contractor to meet at least twice with the ceiling installer. Hold first meeting before submittal of shop drawings to coordinate the mounting condition of all ceiling-mounted intercommunications equipment with ceiling type. During second meeting, coordinate the location of all ceiling-mounted intercommunications equipment in each area.
4. Meet at least once with the mechanical installer prior to fabrication and installation of duct work. Coordinate depth and location of all loudspeaker and duct work in all areas.
5. Meet with Electrical contractor prior to pathway rough-in to coordinate Intercom system requirements in each area.
6. Meet at least once, prior to rough-in, with horizontal cabling installer to verify all required drop points are accounted for. Coordinate cable color according to specification 27 1500.
7. Coordinate all intercommunications system components within millwork/furniture with millwork shop drawings prior to rough-in.
8. Meet at least twice with owner to coordinate network requirements. Hold the first meeting before submittal of shop drawings to coordinate network protocols, including but not limited to: IP address schedules, MAC address schedules, patchbay schedules, security requirements, and VLANs. Hold the second meeting prior to system deployment.
9. Meet at least twice with the owner to coordinate security system integration. Hold the first meeting before submittal of shop drawings to coordinate microphone placement and security tie in requirements. Hold the second meeting prior to system deployment.
10. Coordinate color (including custom color) and finish of all intercommunications system components with Architect prior to ordering. Architect may require custom color of grills, face plates, etc.. AV contractor shall paint or have devices painted by others. The cost for custom colors shall be within the AV Contractors Bid.
11. Coordinate all system components within millwork/furniture with millwork shop drawings prior to rough-in.

### **1.3 DESCRIPTION OF WORK:**

- A. This section includes a fully operational IP platform for school internal communications system incorporating school safety notifications and general communications including but not limited to the following:
  1. The platform shall provide complete internal communications employing IP Technology including the minimum functions listed.
    - a. Two-way Loud Speaking Internal Intercommunications.
    - b. Bell Event announcement
    - c. Emergency announcement that will override any pre-programmed zones assuring that all Emergency/Lockdown etc., are heard at each and every loudspeaker location.
    - d. Capability of prerecording emergency announcements that can be activated by a Soft Key or via a dedicated call-switch.
    - e. Atomic Time Synchronization with Class Change Tones utilizing multiple, programmable schedules for each zone.

- f. Web-based, permission driven user interface.
  - 2. The system shall support a minimum of 1,000 level priorities which shall be user definable, allowing each end point to place a minimum of 5 different priority calls at the same time.
  - 3. Any authorized administrator shall be able to call from outside the school into any classroom, zone or entire school directly via the School District supplied SIP enabled Telephone Network. This shall allow remote monitoring, call-in annunciation and two-way conversation from outside the facility as well as paging into the system. (Compliance with NEMA Standard SB-40 for emergency communications in K-12 Schools)
  - 4. Authorized system users shall be able to create a minimum of twenty (20) automated sequences with emergency instructions, emails and relay activations and replay them. Automated message strings shall be, manually played from a single-button access on the console, on a SIP connected telephone, a panic button or from the web interface.
  - 5. Paging and two-way loud speaking features shall be accessible from any system console or SIP connected telephone.
  - 6. The platform shall synchronize its system time to the network timeserver or a web-based time server.
  - 7. Installation shall be locally survivable for intercom, paging bells, and emergencies such as lockdown, even when the district connection is unavailable.
  - 8. This specification establishes a minimum level of quality, features, and performance for individual components as well as the integrated system.
- B. Equipment submitted in bid proposal that has not been approved by AV Consultant in writing will not be accepted and shall be replaced by approved equipment at contractor's expense. Equipment not listed within this specification, or contract documents, that are required for a complete and working system, shall be of professional grade and used in the same manner as needed for a complete and working system.
  - C. Input plates shall match the color and style being used throughout the project.
  - D. Contractor is responsible for coordinating with all other trades for equipment locations, mounting requirements, supports and plenum space requirements.
  - E. All control processors and controllers are to be on an unswitched power connection.
  - F. All cabling shall be installed in 1" diameter conduit (minimum). Conduit shall be a continuous path from source to within close proximity to final destination.
  - G. Integration of the intercommunications system to the school district's telephone system. (SIP TO SIP INTEGRATION)
  - H. CRISIS LOCKDOWN
    - 1. The system can automatically broadcast emergency instructions throughout an entire campus when an alarm (e.g. lockdown, lockout, shelter, evacuation, security, fire) is tripped or manually activated. The emergency instructions are preprogrammed and require no user intervention. The system provides redundant alarm annunciation over intercom/paging speakers and is not meant to replace primary fire alarm or security systems.
      - a. Shall provide ability to initiate pre-programmed announcements on paging system.

- b. Shall provide ability to clear status by individual location, region, or global.
  - c. Shall provide ability to place in Lockdown, Shelter, or Evacuation Mode.
  - d. Shall provide pop up alarms on Lockdown, Shelter, or Evacuation events.
  - e. Shall provide pop up alarms on any location color status change
  - f. Shall provide ability to initiate lockdown of access-controlled doors.
  - g. Shall provide ability to send email and/or SMS text alerts to authorities or first responders.
  - h. Shall provide ability to open two-way chat to educators, administrators and first responders.
  - i. Interconnect the Fire Alarm system to the intercommunications system such that upon activation of any initiating device, a preset audible alarm will be sent to all intercom speakers. In addition, the contractor shall provide all controls necessary between the two systems such that upon silencing the alarm on the fire alarm panel, it automatically silences the audio file in the intercom system.
  - j. Interconnect the Access Control system to the intercommunications system such that upon activation of an Emergency Lockdown or Preventative Lockdown from the administrative console, web browser, app, etc., a communication protocol will be sent from the intercom system to the access control system that will allow for all controlled doors to be locked, a designated campus wide communication throughout the building, emails, SMS text, etc. A minimum of two types of initiations process shall be programmed e.g. "Emergency Lockdown or "Preventative Lockdown" In addition, the contractor shall provide all controls necessary between the two systems such that the system can easily be reprogrammed to meet the needs of the School District.
- I. Intercommunications system contractor shall participate in a mandatory pre-construction meeting no more than sixty (60) days prior to ordering equipment, and before work can begin. Contractor is responsible for coordinating meeting. The meeting will be held at design consultant's office. All submittals, shop drawings, and bill of materials shall be completed and submitted to design consultant for review eight (8) working days prior to this meeting.
- 1. Intercommunications contractor shall attend the electrical pre-construction meeting per specification 26 0500.

**1.4 QUALITY ASSURANCE:**

- A. Intercom System Qualifications:
  - 1. Local distributor for district wide intercom solution. Intercom system shall match current solution.
- B. Manufacturers:
  - 1. Firms regularly engaged in manufacture of sound equipment, components and



accessories, of types, capacities and characteristics required, whose products have been in satisfactory use in similar service for not less than five (5) years. Equipment supplier shall be authorized representative of the manufacturer of each major piece of equipment and be currently authorized by the manufacturer to furnish, install and service that particular equipment.

2. Manufacturers of intercom systems shall not be the installation party for this system. There must be a 3<sup>rd</sup> party independent representative for the installation. Refer below for 3<sup>rd</sup> part representative requirements.

C. Installer:

1. Qualified with at least five (5) years of successful installation experience with similar systems.
2. Integrating firm shall have worked satisfactorily for a minimum of five (5) years of completing systems equal to this scope, quality, type and complexity.
3. Key personnel assigned to the project shall each have minimum of (10) years of experience in completing systems equal to this scope, quality, type and complexity.
4. Contractor shall be a factory authorized distributor of all equipment specified for the geographical area of the project.
5. Contractor shall maintain complete installation and service facilities for the duration of the project contract.
6. Contractor shall have current manufacturer certificates for system and equipment listed within this specification.
7. All contractors bidding on this project must have local representation that is within four (4) hours of the job site.

D. Contractor must follow the standards described within:

1. BICSI/AVIXA AV Design Reference manual.
2. ANSI/AVIXA 2M-2010 Standard guide for Audiovisual Systems Design and Coordination Processes.
3. ANSI/AVIXA 10:2013 Audiovisual Systems Performance Verification Guide.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

F. Comply with NFPA 70 and with NEMA Standard SB-40 for Emergency Communications in K-12 schools.

G. Comply with UL 60950.

**1.5 SUBMITTALS:** Refer to Section 26 0502 for requirements.

**1.6 WARRANTY:**

A. Systems shall be guaranteed for a period of one (1) year from the date of substantial completion against defective materials, inferior workmanship or improper installation adjustment. Guarantee shall cover all parts and labor.

B. If system failure causes audiovisual system to be inoperative or unusable for its intended purpose, contractor, when notified of the problem, shall repair system so it will be operational and usable within three (3) business days. If defective components cannot be repaired in time, provide temporary equipment as required.

- C. Contractor shall supply a one (1) year warranty on all system programming from the date of substantial completion. During this time period, upon owner request, the contractor shall provide programming changes up to four (4) times free of charge. During this time the programs shall be password protected. At any time during the (1) year, the owner can terminate the warranty and request the programming of each system. At this time the programs are to be turned over to the owner and all passwords are to be removed. The owner shall own all rights to the programming after this time, to be used in this facility.
- D. Contractor shall honor equipment warranties for term established by manufacturer if greater than warranty time frame mentioned above.
- E. Prior to the end of the 1-year warranty. The Intercom Integrator shall preform the following:
  - 1. Three (3) months prior to end of warranty remind the owner and design consultant that the end of the warranty is approaching. At this time coordinate the events below with the owner and notify the design consultant of the time of the walk through(s).
  - 2. One (1) month prior to end of warranty, walk through campus and verify all components are working. Supply list of components with location, type equipment and status to the design consultant and Owner. Correct any and all malfunctions as necessary.

## **PART 2 - PRODUCTS**

### **2.1 SOUND SYSTEMS:**

- A. The platform shall utilize state of the art IP Technology, Call-in Notification, School Safety Paging and Evacuation tones, IP infrastructure, Atomic Time Synchronization with Class Change Tones utilizing multiple, programmable schedules for each zone, Two-way hands-free Internal Intercommunications and Paging, and Program Distribution. The system shall be easy to learn and operate. All standard programming shall be web based and user friendly to allow the system administrator the ability to easily program system features.
- B. Provide complete and satisfactorily operating school communications and school safety as described herein, using materials and equipment of types, sizes, ratings, and performances as indicated. Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction, in accordance with published product information. Coordinate the features of all materials and equipment so they form an integrated system, with components and interconnections matched for optimum performance of specified functions.
- C. The platform shall be a single electronic system consisting of a minimum of ten (10) intercom channels per facility, (classroom) IP loudspeakers, corridor loudspeakers, inside and outside horns, call-in switches, and SIP phone integration.
- D. Each Classroom shall be provided with an IP Speaker module interface and call- in switch, each with their own annunciation path and priority.
- E. Call-ins may automatically annunciate (display of priority and location) to administrative consoles, SIP enabled phones and outside phones.
- F. Call-ins shall be programmed to automatically change priority and annunciation route based on age of call-in and original priority.

- G. Call-ins may have priority and annunciation routing changed by user action from a console or SIP enabled phone.
- H. Call-in annunciation routing shall include playing pre-recorded audio over speakers, sending a pre-configured e-mail and/or activating relays.
- I. The platform shall lend itself to expansion by simple addition of hardware modules.
- J. The platform shall directly connect to the WAN/LAN without the need for a separate server at each school location. Configuration, including bell schedules, calendars, and emergency sequences can remotely be created, changed, stored and downloaded to the system by an authorized user from a browser-based interface.
- K. The platform shall provide the ability to initiate school safety paging announcements, evacuation tones and take cover tones from any telephone within the facility or outside the facility to any other location within the facility or district.
- L. The platform shall provide the ability to selectively communicate or monitor individual classrooms in emergency situations from any telephone within the facility or outside the facility to any other location within the facility; all communication within the classroom shall be hands free and will not require any interaction by the classroom user.
- M. IP addressable loudspeaker modules for individual rooms shall be system programmable and may be assigned any two, three, four, five or six-digit number as well as name and description. Any extension may be reassigned at any time.
- N. IP-enabled two-way voice communication shall be available from any provided telephone or administrative console through any loudspeaker in the system. This shall allow hands free communication to any classroom or any individual loudspeaker unit. A programmable pre-announce tone shall sound immediately before the intercom path is opened and a supervisory tone shall continue to sound at regular intervals when loudspeaker monitoring is active, complying fully with all privacy legislation. Pre announce tone and supervisory tones shall be disabled during designated emergencies automatically.
- O. Integrated Master Clock with unlimited schedules, unlimited events, and automatic Daylight Savings time correct. Up to five (5) schedules may be active on any given day for each school. User shall be able to select from twenty-five (25) standard included tones or unlimited user created and uploaded audio files for class change signaling and messaging. In addition, scheduled events shall include relay actions and email notifications. The platform shall allow control of the bell schedules via the district WAN/LAN without the need for a separate computer at the school location. Bell schedules can remotely be created, changed, stored and downloaded to the system by an authorized user from a browser-based interface.

## **2.2 SYSTEM FUNCTIONS/SOFTWARE**

- A. Server Software TCU2000SW
  - 1. Provides district wide paging, bell event scheduling, emergency notification and configuration for entire district.
  - 2. Reports on feature usage, system activity, etc. shall be available from the district-wide web interface.
  - 3. Ability to perform configure system and initiate system features via district wide

web-based interface.

4. The software has the ability to sync system time to the Atomic Clock Signal or to the school's or districts network time server
  5. The software will provide a web-browser to deliver district wide emergency paging, pre-recorded messages and tones from any authorized computer in the facility or the district. The software must be capable of automatically notifying district personnel via the WAN of an alarm condition.
  6. The software can automatically broadcast page emergency instructions via associated system hardware throughout an entire district when an alarm (e.g. lockdown, lockout, security, fire) is initiated via the web-based interface. The emergency instructions are preprogrammed and require no user intervention. The system provides redundant alarm annunciation over intercom/paging loudspeakers and is not meant to replace primary fire alarm or security systems
  7. The software shall support VoIP Telecenter Campus Controllers for a minimum of 1000 facilities.
  8. The software shall support a minimum of 50,000 IP Loudspeaker modules, district wide.
- B. VoIP Single Campus Controller Rauland-Borg Telecenter Series TCC2000 with the following features and capabilities:
1. Provides call routing for paging and intercom for a single facility
  2. System shall connect to the district provided Telephone Network via a SIP connection.
  3. The VX Works based Operating System and system programming database shall be stored in non-volatile flash memory. The Operating System can be easily upgraded through configuration without requiring replacement of any chips.
  4. Support a flexible numbering plan allowing two, three, four, five, or six-digit extensions.
  5. SIP interface to a district provided Telephone Network shall be capable of allowing connected phones to display classroom call-ins, answer internal intercom call-ins, make pages and change priorities of call-ins in progress.
  6. Direct Dialing, two-way amplified voice intercom between any provided telephone or admin console and loudspeaker without the use of a press to talk or talk listen switch.
  7. Ability to place up to five (5) levels of call-in from any call-in switch per area.
  8. The ability to answer intercom call-ins registered at pre-selected telephones.
  9. The ability to automatically escalate incoming call-ins to an alternate administrative console or SIP telephone or group of telephones if they remain unanswered for a predetermined amount of time.
  10. The ability to remotely locate IP Campus Controller. The controller shall not need direct connection to any classroom via home run or distributed wiring. It

shall communicate solely through the IP LAN network.

11. Single button access from any telephone on the system to distribute emergency announcements within the facility to all or select locations equipped with loudspeakers. Emergency announcements originating from any assigned administrative telephone shall have priority over all regular system functions.
12. Store a minimum of forty-eight (48) hours of Bell Event Schedules, all emergency notification sequences as well as facility wide configuration.
13. System has the ability to sync system time to the Atomic Clock Signal or to the school's or districts network time server.
14. System's SIP Interface shall provide:
  - a. Audio paging access from any telephone to any single intercom loudspeaker, zone (group) of intercom/paging loudspeakers, or all loudspeakers/paging horns throughout the entire facility.
  - b. Single button access from any telephone on the system to initiate alarm signals within the facility to all or select locations equipped with loudspeakers. A minimum of twenty-five (25) separate distinct alarm signals shall be provided. Alarm signals originating from any assigned administrative telephone shall have priority over all regular system functions.
15. The system will have the ability to utilize a web-browser and USB microphone to deliver district wide live emergency paging, pre-recorded messages and tones from any authorized computer in the facility or the district. The system must be capable of automatically notifying district personnel via the WAN of an alarm condition.
16. The system can automatically broadcast page emergency instructions throughout an entire school when an alarm (e.g. lockdown, lockout, security, fire) is tripped or manually activated. The emergency instructions are preprogrammed and require no user intervention. The system provides redundant alarm annunciation over intercom/paging loudspeakers and is not meant to replace primary fire alarm or security systems.

C. IP addressable Modules TCC2011:

1. System shall provide multiple IP addressable modules for intercom, paging and relay activation.
  - a. All modules are POE 802.3af compliant
  - b. All Modules support DHCP
  - c. All Modules connect to network with a single RJ45 connector
2. IP Loudspeaker Module shall interface to school's data network, a loudspeaker, and multiple call switches.
  - a. A minimum of five (5) levels of call-in can be placed from an IP Loudspeaker Module. The call-ins route to designated administrative consoles and select SIP connected telephones and can only be cleared from the system once answered. If a call-in is not answered within a

preprogrammed time the call-in may reroute to other telephones and consoles, and announce over selected or all loudspeakers.

- b. The ability to belong to one or more of a minimum of one-hundred (100) independent zones for zone paging, program/music distribution zones and class change tone reception; this assignment is a programmable function, change able by time of day. Each IP Loudspeaker Modules location shall be programmed in software to belong to any combination of software zones. Software/hardwired zones must be configured as part of an unlimited number of district wide groups for school district emergency announcements. These district announcements must be accessed via microphone, a web-browser or telephone.
  - c. IP Loudspeaker Modules shall be designed to mount near ceiling and wall loudspeakers and in the plenum space.
3. IP-addressable Zone Paging Module TCC2022:
- a. Zone paging module shall connect multiple loudspeakers for all page, zone paging, bells, audio events and, emergency notification.
  - b. Zone Paging Modules shall be rack and wall mountable.
  - c. Zone Paging modules shall be able to belong to one or more of 100 independent zones for live paging, bells, pre-recorded audio and emergency notification
- D. IP Addressable Aux I/O Module TCC2033:
1. Aux I/O Module shall have two input contacts and two output contacts.
  2. Input and output contacts are individually addressable.
  3. Aux I/O Module shall be wall and rack mountable.
  4. User can program relays to be activated manually, through an event/bell schedule and during emergency notification
- E. IP Addressable Program Line Input Module – Rauland Model TCC2055
1. Line Input Module converts stereo or mono line-level analog audio to IP-Based Data for use in the Telecenter U system.
  2. Equipped with 3.5mm (headphone style) input socket.
  3. Desktop or rack mountable with Rauland Model TCC2099 Universal Rack Mounting Kit.
  4. Includes a male 3.5mm to dual male RCA connector cable.
- F. IP Addressable Administrative Console TCC2044:
1. A full color screen with four (4) soft keys, three (3) line select, volume control, push to talk, speakerphone mode and left/right and up/down scrolling.
  2. Audio paging access from any Console to any single intercom loudspeaker, zone (group) of intercom/paging loudspeakers, or all loudspeakers/paging horns throughout the entire school.
  3. Programmable soft key access from any console on the system to initiate alarm

signals within the school to all or select locations equipped with loudspeakers. A minimum of twenty-five (25) separate distinct alarm signals shall be provided. Alarm signals originating from any assigned administrative telephone shall have priority over all regular system functions.

4. Programmable soft key access from any console to automatically broadcast page emergency instructions throughout an entire school when an alarm (e.g. lockdown, lockout, security, fire) is tripped or manually activated. The emergency instructions are preprogrammed and require no user intervention. The system provides redundant alarm annunciation over intercom/paging loudspeakers and is not meant to replace primary fire alarm or security systems.
  5. Ability to perform intercom to any single IP Addressable Loudspeaker Module.
  6. Ability to display three (3) call-ins at a time on the screen, with unlimited number of call-ins annunciating and the ability to scroll to view all call-ins.
  7. Ability to upgrade a call-in via soft key
  8. Ability to change which bell event schedule(s) are active on current day.
  9. Programmable soft key access from any console for activating relays, school wide
  10. Ability to maintain, along with controller and other IP Modules system functions, including intercom, bells and paging in the event of district wide connection loss.
  11. Provide three (3) administrative consoles. Two (2) in the reception area and one (1) in the principal's office.
- G. Audio Paging/Program Amplifiers: Stewart Audio – CVA25-1 25V, and/or Atlas Sound – CP400.
1. Power amplifier(s) shall be provided to provide a minimum of 2 watts of power to all paging loudspeakers, and 7 watts of power to all paging horns.
  2. The maximum load on the paging/program amplifiers shall be 80% of the rated maximum output of the amplifiers.
  3. Provide 25-volt transformer output for all zones that connect more than one (1) loudspeaker together and/or the distance from amplifier to the loudspeaker is greater than 25'.
  4. Any exterior zone shall be connected to a 200-watt amplifier channel.
- H. Normal/Emergency Call Switch – Rauland TCDPB2 Dual Level Call-in Switch Cancel
1. Normal/Emergency Call Switches indicated on the drawings shall provide the following functions and features:
    - a. One (1) "Normal" call switch that shall activate a distinctive "NORM" level call from a single button activation. The button shall be clearly marked "NORM" and will route the call-in to any one or more Administrative Telephones or SIP interface to offsite telephones. This button may also be used as a "check-in" button during crisis situations.

- b. One (1) "Emergency" call switch that shall activate a distinctive "EMERGENCY" level call from a single button activation. The button shall be red in color and shall be clearly marked "EMERGENCY" and will route the call-in to any one or more Administrative Telephones or SIP interface for quick and easy response from an Administrative Telephone or off-site telephone.

I. SIP Gateway

1. The SIP Gateway shall provide a communications path to the phone system from the intercom system.

J. Loudspeakers

1. AtlasIED and Quam loudspeaker assemblies are the basis of design. Intercom manufacturer equivalent loudspeakers are allowed if they meet the function and form of the loudspeakers listed below.
2. Loudspeaker cabling for common zones shall use a 16 AWG 2-pair stranded conductor cable assembly unless otherwise noted. Refer to Audiovisual Cable and Conduit Schedule on the drawings for approved cabling manufacturer.
3. Type 'IC1' - loudspeaker assembly (lay-in tile ceiling):
  - a. Atlas – SD72W w/ 81-8R mounting ring and CS95-8 enclosure
  - b. Quam – C10X/BU/WS w/ SSB-2 mounting ring and ERD-8U enclosure
  - c. Gyp loudspeaker with 10 oz. magnet and 5 watt 24/70V transformer. 95dB SPL 1W/1M with 102dB max SPL at maximum tap. 60Hz – 8kHz frequency response  $\pm 3$ dB and 90-degree dispersion angle.
4. Type 'IC2' - loudspeaker assembly (hard lid ceiling):
  - a. Atlas – SD72W w/ 76-8 mounting ring and BMTT95-8 enclosure
  - b. Quam – C10X/BU/WS w/ SSB-7 mounting ring and ERD-8U enclosure
  - c. Gyp loudspeaker with 10 oz. magnet and 5 watt 24/70V transformer. 95dB SPL 1W/1M with 102dB max SPL at maximum tap. 60Hz – 8kHz frequency response  $\pm 3$ dB and 90-degree dispersion angle.
5. Type 'IC3' - loudspeaker assembly (structurally mounted in open ceiling):
  - a. Atlas – SD72W w/ BMTT95-8 enclosure
  - b. Quam – C10X/BU/WS w/ ERD-8U enclosure
  - c. Open ceiling direct mount to structure loudspeaker with 10 oz. magnet and 5 watt 24/70V transformer. 95dB SPL 1W/1M with 102dB max SPL at maximum tap. 60Hz – 8kHz frequency response  $\pm 3$ dB and 90-degree dispersion angle.
6. Type 'IC4' - loudspeaker assembly (lay-in tile IP);
  - a. Intercom Manufacturer specific assembly with an IP Addressable module and loudspeaker. IP module shall be rated to be installed above the ceiling if it is not integral with the loudspeaker.
7. Type 'IW1' - loudspeaker assembly (recessed wall mount-interior):
  - a. Quam – 8C5PAX/TBLU w/ ES-8 enclosure and BS8W grill
  - b. Indoor recessed wall 8" loudspeaker with 5 oz. magnet and 5 watt 24/70V transformer. 92dB SPL 1W/1M with 99dB max SPL at maximum tap. 65Hz – 17kHz frequency response  $\pm 3$ dB and 100-degree dispersion



angle.

8. Type 'IW2' - loudspeaker assembly (recessed wall mount-exterior):
  - a. Atlas – VTF-152UCN or VTF-157UCN w/ AR Adapter Ring
  - b. Exterior recessed wall 4" loudspeaker with 5 watt 24/70V transformer. 96dB SPL 1W/1M with 107dB max SPL at maximum tap. 600Hz – 5.5kHz frequency response  $\pm 5$ dB and 170-degree dispersion angle.
9. Type 'IW3' loudspeaker assembly (exterior mounted horn):
  - a. Atlas – AP-15T
  - b. Exterior Horn with compression driver and 15-watt 24/70/100V transformer. 106dB SPL 1W/1M with 120dB max SPL at maximum tap. 400Hz – 14kHz frequency response  $\pm 5$ dB and 70-degree dispersion angle.

K. Cabling:

1. Provide and install appropriate number of analog and horizontal cables, patch cables, for all terminated data drops, between switches, etc. so that building-wide networking will be operational once all installation is complete.
  - a. Provide manufacturer recommended cabling for all locations shown on plans.
  - b. Horizontal/Category provided per specification 27 1500 (i.e. IP addressable Speakers, Classroom Modules, Call Switches, Zone Modules, Console, Controller, etc.)
  - c. Provide cabling rated for the environment that it is installed in (i.e. underground conduit, conduit in slab on grade). All cabling installed in wet locations shall be listed for use in wet locations.

L. Vandal Resistant call-in station – Quam CIS4/8

1. Device shall provide 2-way communication from location to main office. Connect call switch to IP module, mount IP module on secure side of wall/door.

M. Clocks:

1. All clocks shall be battery powered. The contractor shall provide a new battery for each clock provided and set each clock to the correct local time/sync with the master clock system. Room types will have different size requirements.
2. 12" clock – American Time and signal – E56BAQD304BF
  - a. Provide (Qty.1) clock for the following spaces:
    - i. Typical Classrooms
    - ii. Specialty Classrooms (Drama, Art, Music, Media Arts)
    - iii. Collaboration Areas
    - iv. Offices
    - v. Work rooms
    - vi. Conference rooms
    - vii. Locker and Team Rooms
3. 15" clock – American Time and signal – E66BAQD304BF (Recreational Space Clock)
  - a. Provide (Qty.1) clock per the following spaces:

- i. Weight Room
  - ii. Commons/Dining
  - iii. Metal/Wood Shops, AG Labs
  - iv. Kitchen
  - v. Commons/learning stairs
  - vi. Media center
4. Provide wire guard on all clocks in locations where other devices are protected. Coordinate with fire alarm plans for locations requiring wire guards.

N.

### 2.3 INTERCOMMUNICATION, PROGRAM DISTRIBUTION, CLOCK/TIME SIGNALING SYSTEM

1. Separately addressable paging zones shall be provided as indicated on the drawings. Zones shall be capable of being grouped for various call scenarios as defined or requested by the owner.
2. Refer to the intercom drawings for identification of zones, zone types, and ceiling construction type.
  - a. Individual zones are designated with "Z-ID"
  - b. Common distributed zones are identified with a unique zone number "Z-#X#".
3. Space requirements:
  - a. Classrooms/Teaching spaces.
    - i. The IP module/loudspeakers for each space shall be utilized for the intercommunication system.
    - ii. One (1) Call switch shall be provided at the primary teaching station. Coordinate location of primary teaching location with drawings.
    - iii. One (1) Clock located above the entrance door.
  - b. Shared spaces between Classrooms/Teaching spaces.
    - i. The IP module/loudspeakers for each space shall be utilized for the intercommunication system.
    - ii. One (1) Call switch shall be provided on the wall adjacent to the main hallway.
    - iii. One (1) Clock located above the entrance door.
    - iv. These rooms will be used as shelter in place rooms for adjoining classrooms.
  - c. Specialty Teaching spaces with high ambient noise floor (Wood/Metal/AG shops).
    - i. Distributed ceiling recessed loudspeakers (Qty. as required) at 14' by 14' minimum spacing, type as required for ceiling construction.
    - ii. Visual strobe
    - iii. One (1) Call switch shall be provided at the primary teaching station. Coordinate location of primary teaching location with drawings.
    - iv. One (1) Clock located above the entrance door
  - d. Private Offices, Conference rooms, Faculty Lounges & Work Rooms (outside of the main office/administration suite)
    - i. One (1) ceiling mounted loudspeaker, type as required for ceiling construction.

- ii. Connect to adjacent corridor zone you enter the office from
  - iii. Offices off of a classroom shall be on the same zone as the classroom
  - iv. Gymnasium
- e. Gymnasium
  - i. Ceiling mounted loudspeakers, Qty. and type as required for ceiling construction and adequate coverage (< 6dB level variation).
  - ii. One (1) Call switch shall be provided co-located with any light switches adjacent to each entrance.
- f. Cafeteria/Commons/Dining
  - i. Ceiling mounted loudspeakers, Qty. and type as required for ceiling construction and adequate coverage (< 6dB level variation).
- g. Kitchen
  - i. Ceiling mounted loudspeakers, Qty. and type as required for ceiling construction and adequate coverage (< 6dB level variation).
  - ii. One (1) Call switch shall be provided co-located with any light switches adjacent to main entrance.
  - iii. Within the Kitchen office provide a two-way system with call button and loudspeaker.
- h. Corridors, Vestibules & Open Collaboration/Circulation areas
  - i. Distributed ceiling recessed loudspeakers (Qty. as required) at 20' minimum spacing, type as required for ceiling construction.
  - ii. Rooms that are wider than 25' shall require an additional row of loudspeakers and located on a maximum of a 20' x 20' spacing centered in the room.
  - iii. Coordinate with ceiling devices and locate adjacent to smoke detectors when within few feet of one. Loudspeakers shall be in line with any lighting within the space
  - iv. Provide a minimum of one (1) loudspeaker for each space type
- i. Stairwells
  - i. One (1) ceiling mounted loudspeaker, type as required for ceiling construction.
  - ii. Connect to the adjacent corridor zone.
- j. Restrooms
  - i. One (1) ceiling mounted loudspeaker, type as required for ceiling construction.
  - ii. Connect to the adjacent corridor zone
  - iii. Do not provide loudspeakers in single use restrooms adjacent to a corridor zone.
- k. Administration Suite (Private offices, Conference rooms, Nurse areas, work rooms, reception, etc. within the main administration suite)
  - i. Distributed ceiling recessed loudspeakers (Qty. as required) at 20' minimum spacing down corridors and 14' x 14' in open areas, type as required for ceiling construction.

- ii. Provide a minimum of one (1) loudspeaker for each space type.
      - iii. Provide a minimum of one (1) loudspeaker on an individual zone in the reception area. General pages from the reception area shall not play over this zone, it shall only be used for prerecorded messages.
    - I. Building Exterior
      - i. Distributed recessed loudspeakers (Qty. as required) to cover all sides of the building and all entrances.
      - ii. Coordinate and co-locate loudspeaker rough-in with exterior fire alarm horn strobe locations.
      - iii. Provide unique zone for each side of the building (North/South/East/West)
      - iv. Provide 'IW3' type loudspeakers on areas with:
        - 1. Playground equipment
        - 2. Fields
        - 3. Other play surfaces
      - v. Provide 'IW2' type loudspeakers on the front of the building and in locations where the property line is less than 30' from the building.
    - m. Rooms smaller than 100 sqft and that are adjacent to a corridor/hallway will not require a loudspeaker when an announcement is audible within the room. Audible within the room shall be defined as 15 dB above the ambient noise within the room.
      - i. Vestibules are excluded from small rooms and will require a loudspeaker tied to the adjacent corridor zone.
- B. All class-change bell signaling shall be sounded over the intercommunication system.
  - 1. Each dialing administrative console in the system shall be programmable for the following options:
    - a. Allow zone paging.
    - b. Allow All-Page announcements.
    - c. Allow Executive Override.
    - d. Allow Emergency paging.
    - e. Allow activation of Time Zone tones.
    - f. Set the priority level and target display of "normal" calls.
    - g. Set the priority level and target display of "emergency" calls.
    - h. Assignment of architectural number.
    - i. Class of Service.
    - j. Assignment of associated speaker to paging zone.
    - k. Automatic Call-Back-Busy.
    - l. Call Forward-No Answer.
    - m. Call Forward-Busy.
    - n. Allow activation of security monitoring functions on a per room and per zone basis.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Wiring shall be installed in metallic conduit to cable trays and provided with necessary junction and pull boxes. All wiring shall be color coded and in accordance with the manufacturer's instructions, local and national codes. Care shall be exercised in wiring to avoid damage to the cables. All boxes shall be plumb and square. Cables shall be pulled continuous without splicing, leaving ends in lengths as directed by the manufacturer's representative.
- B. After all circuits and cables have been pulled and completed from one extremity to the other, the electrical contractor shall check all circuits free of opens, shorts and grounds. The electrical contractor shall identify and tag all cables at the head end.
- C. Provide all equipment, wiring, conduit, boxes, rough-in, etc., according to the plans and specifications.
- D. The manufacturer's representative shall make all final connections to the equipment, shall test and adjust the systems, and shall instruct the proper parties as to care and operation.
- E. Any additional equipment required for a fully functional system to meet the intent of the specifications shall be provided whether or not specifically listed herein.
- F. Mount punch down block for system terminations, within the equipment rack.
- G. Test the reception at each clock location, per manufacturer's instruction, to determine the actual location with the Architect.

### **3.2 INSTALLATION OF SOUND SYSTEMS:**

- A. Install sound systems as indicated, in accordance with equipment manufacturer's instructions, and with recognized industry practices, to ensure that system equipment complies with requirements. Comply with requirements of NEC and applicable portions of NECA's "Standard of Installation" practices.
- B. Carefully match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.
- C. Coordinate with other electrical work, including cable/wire, raceways, electrical boxes and fittings, as appropriate to interface installation of clock and program systems work with other work.
- D. Control Circuit Wiring:
  - 1. Install control circuits in accordance with NFPA 70 and as indicated. Provide number of conductors as recommended by system manufacturer to provide control functions indicated or specified.
  - 2. The contractor shall mount a main distribution frame behind the Integrated Electronic Communications Network console. All wires shall be laid down on terminal punch blocks and identified by the actual room location it serves. All the communications points shall be wired into this main distribution frame, laid down in sequence, and identified by which line it is on and the point position it serves.

3. All housings are to be located as specified and shown on drawings.
  4. Make installation in strict accordance with approved manufacturer's drawings and instructions.
  5. The contractor shall provide necessary transient protection on the AC power feed, all station lines leaving or entering the building, and all central office trunks. All protection shall be as recommended by the equipment supplier and referenced to earth ground.
- E. Wiring Within Enclosures:
1. Provide adequate length of conductors. Bundle, lace, and train the conductors to terminal points with no excess. Provide and use lacing bars.
  2. Provide physical isolation from each other for speaker-microphone, line-level, speaker-level, and power wiring. Run in separate raceways, or where exposed or in same enclosure, provide 12-inch minimum separation between conductors to speaker-microphones and adjacent parallel power and telephone wiring. Provide physical separation as recommended by equipment manufacturer for other Integrated Electronic Communications Network system conductors.
- F. Identification of Conductors and Cables:
1. Use color coding of conductors and apply wire and cable marking tape to designate wires and cables so all media are identified in coordination with system wiring diagrams.
- G. Weatherproofing:
1. Provide weatherproof enclosures for items to be mounted outdoors or exposed to weather.
- H. Repairs:
1. Wherever walls, ceilings, floors, or other building finishes are cut for installation, repair, restore, and refinish to original appearance.
- I. Pathway Requirements:
1. General:
    - a. All pathways shall be designed, constructed, grounded and installed in accordance with all recommendations delineated within TIA 569-B and Standard TIA 942.
    - b. Prior to placing any cable pathways or cable, the contractor shall survey the site to determine job conditions will not impose any obstructions that would interfere with the safe and satisfactory placement of the cables. Arrangements to remove any major obstructions not identified on plans need to be determined at that time with the Engineer.
  2. Conduits:

- a. Achieve the best direct route parallel with building lines with no single bend greater than 90 degrees or an aggregate of bends in excess of 180 degrees between pull points or pull boxes.
- b. Conduit runs shall not have continuous sections longer than 100 feet without a pull box. Refer to rough-in schedule for conduit fill capacity.
- c. Intercommunication system conduits shall not be routed over or adjacent to heat sources such as boilers, hot water lines, or steam lines, nor should they be routed near large motors, generators, photocopy equipment, or electrical power cabling and transformers.
- d. After installation, conduits shall be clean, dry, unobstructed, capped for protection, labeled for identification, reamed and fitted with bushings.
- e. A 200lb pull cord (nylon, 1/8" minimum) shall be installed in any empty conduit.

3. Pull Box Requirements:

- a. NEC sized pull boxes are not acceptable. Follow BICSI and EIA/TIA 569-B guidelines for pull box sizing.
- b. Provide pull boxes in sections of conduit that are 100 feet or longer, contain more than two 90-degree bends, or contain a reverse bend.
- c. Conduits that enter a pull box from opposite ends should be aligned.
- d. Pull boxes shall have a length 12 times the diameter of the largest conduit.
- e. All pull boxes must be accessible.

J. Cabling System:

1. Follow TIA/EIA-568A for commercial buildings cabling.
2. Provide a minimum 6" service loop in each system junction box. Cables shall be coiled in the in-wall boxes if adequate space is present to house the cable coil without exceeding manufacturers bend radius.
3. In a false ceiling environment, a minimum of 3 inches shall be maintained between cable supports and false ceiling. At no point shall cable(s) rest on lay-in ceiling grids or panels.
4. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
5. Cables shall not be attached to ceiling grid seismic support wires or lighting fixture seismic support wires. Where support for cable is required, the contractor shall install appropriate carriers to support the cabling.
6. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost

to the Owner.

7. Pulling tension for balanced twisted pair shall not exceed 25lbf and for optical fiber shall not exceed 50lbf.
  8. Pair untwist at the termination shall not exceed 0.125". The cable jacket shall be maintained as close as possible to the termination point.
  9. Cable shall not be draped on, tied or otherwise secured to electrical conduit, plumbing, ventilation ductwork or any other equipment. Cable shall be secured to building supports or hangers or to additional blocks or anchors specifically installed for this purpose.
- K. Cabling groups and conduit separation:
1. Refer to "CABLING GROUPS AND CONDUIT SEPARATION SCHEDULE".
- L. Firmly secure all equipment in place that is not intended for portability.
- M. Mount projectors permanently and provide mechanical index ensuring precise alignment of the projected image.
- N. Provide adequate structural support for Intercommunications system components. Provide fastenings and supports with a safety load factor of at least five.
- O. Coordinate with access control system installer for programming and proper interfacing of the intercom system to initiate lockdown procedures as directed by the School District.
1. The contractor shall include in the base contract all costs required to program the multiple lockdown procedures based upon the requirements and direction of the owner.

### **3.3 GROUNDING:**

- A. All grounding and bonding shall be done according to ANSI J-STD-607-A, TIA 942, and NEC.
- B. All cabinets/racks shall utilize paint piercing grounding washers, to be used where rack sections bolt together, on both sides, under the head of the bolt and between the nut and rack.
- C. All racks shall further utilize a full-length rack ground strip attached to the rear of the side rail with the thread-forming screws provided to ensure metal-to-metal contact. Similar to Panduit RGS.
- D. All active equipment shall be bonded to ground. If the equipment manufacturer provides a location for mounting a grounding connection, that connection shall be utilized. All active equipment shall be bonded using the appropriate jumper for the equipment being installed using the thread-forming screws. Similar to Panduit RG.
- E. Racks shall have individual, appropriately sized conductors bonded to the grounding backbone. Do not bond racks or cabinets serially – daisy-chained rack grounds will not be accepted.
- F. Refer to electrical diagrams for additional ground connection requirements.



### 3.4 LABELING

- A. The contractor shall develop and submit for approval a labeling system for the cable installation. The Owner will negotiate an appropriate labeling scheme with the contractor. At a minimum, the labeling system shall clearly identify all components of the system: racks, cables, panels and wall plates. The labeling system shall designate the cables origin and destination and a unique identifier for the cable within the system. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme.
- B. All labels shall meet UL 969 requirements for legibility, defacement and adhesion requirements. Handwritten labels are not allowed. All labels shall maintain consistent typeface, size and color.
- C. Provide laminated plans (minimum size 11x17) of all INTERCOMMUNICATIONS as-built plans (including riser diagrams) intercom rack. Contractor shall be responsible for providing a 1RU drawer.
- D. Label each equipment with the date (month/year) that it was installed along with the IP address, if applicable, and equipment type.

### 3.5 CYBER SECURITY

- A. Contractor shall change all default usernames and passwords for all network devices provided. A Strong Password should include at a minimum the following:
  - 1. Be at least 12 characters in length
  - 2. Contain both upper and lowercase alphabetic characters (e.g. A-Z, a-z)
  - 3. Have at least one numerical character (e.g. 0-9)
  - 4. Have at least one special character (e.g. ~!@#%&\*()\_-=)
  - 5. Cannot contain full words
- B. No written username or passwords shall be located in any areas of installation.
- C. Network devices to be set up on a separate network other than owner's LAN ensuring no internal or external users can access system without authorization.
- D. Follow manufacturers hardening guide and use best industry practices to secure network and devices provided by contractor and associated with system.

### 3.6 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services:
  - 1. Provide services of a duly factory authorized service representative for this project location to supervise the field assembly and connection of components and the pre-testing, testing, and adjustment of the system.
- B. Inspection:
  - 1. Make observations to verify that units and controls are properly labeled, and

interconnecting wires and terminals are identified. Provide a list of final tap settings of paging speaker line matching transformers.

C. Testing:

1. Upon completion of installation of each system and after electrical circuitry has been energized, demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units on site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with testing.
2. Before inspection by owner and Intercom Consultant, and after completion of the installation, conduct system tests and make necessary corrections for proper system operation.
3. Adjust, balance and align equipment for optimum quality and to meet the manufacturer's published specifications.
4. All limiters and/or compressors shall be set to prevent operators from over-adjusting sound levels and damaging system components.
5. System shall have no audible hum, noise, RFI, or distortion when operating under normal conditions. The system shall reproduce material at the loudspeakers rated output level without audible distortion. All input levels shall be pre-set so system may be operated without causing unstable feedback under normal use.
6. Adjust gain controls for optimum signal-to-noise with 0 dBu at a line-level input.
7. Perform polarity checks of loudspeaker lines by means of a polarity tester or use DC source at one end of each line and a voltmeter at the other end. Loudspeaker lines shall be identically polarized with respect to color coding.
8. Loose parts and poor workmanship or soldering shall be replaced.
9. Sweep Loudspeaker systems with high-level sine wave or 1/3 octave pink noise source. Correct causes of buzzes or rattles related to Loudspeakers or enclosures. Notify the owner of external causes of buzzes or rattles.
10. The contractor shall provide system testing as described herein using up-to-date and industry accepted test equipment appropriate to the types of links being tested and in accordance with the latest edition of IEC 61935-1.
11. Horizontal cabling contractor shall test all twisted pair cabling used within the system following the standards in specification 27 1500 under the testing section. Provide documentation of testing to Intercom Consultant prior to final walk through.

- D. The Intercom contractor shall notify the design consultant at least three (3) days prior to the scheduled site visit if the system is not complete. At the time of final commissioning, if the design consultant determines that the systems are not sufficiently complete to test and produce a final punch list then a return visit will be required. The Intercom design consultant's return visit will be paid for in advance by the Intercom contractor at a flat rate of \$750 per person, at no cost to the owner.

### 3.7 OCCUPANCY ADJUSTMENTS:

- A. When requested by the Architect within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels, resetting matching transformer taps, and adjusting controls to suit actual occupied conditions.

### **3.8 TRAINING**

- A. The contractor shall provide and implement a complete and comprehensive staff training program for all administrators, facility staff members and teachers. This mandatory training program will provide school staff with a complete understanding of how to utilize and properly operate all functions.
- B. The training program shall be implemented by a staff member/trainer employed by the contractor. The trainer must be factory certified to provide training on their product.
- C. All training must be scheduled through the Ogden School District facilities department. No exceptions. Any training that occurs outside of the district facilities department channel will not count as contract fulfillment.
  - 1. As training sessions are completed, the trainer will provide the school's administrative staff and school district's staff with a document listing all of the staff and faculty members who attended, received and completed the training program.
- D. Training shall not occur until the Intercom consultant has been notified that systems are complete, and the final punch list visit has occurred.
  - 1. All system deficiencies shall be corrected prior to the first training session.
- E. Provide two (2) three-hour sessions of in-service training with this system. These sessions shall be broken into segments that will facilitate the training of individuals in the operation of this system. Operators Manuals and Users Guides shall be provided at the time of this training.
- F. Training shall be recorded using a video recording device that support a minimum resolution of 1080P/60 with an integrated microphone connection for an external microphone and a camera tri-pod mount. Presenter shall be wearing a lapel microphone that connects to the recording device and a Tripod shall be used for stabilizing the recording device. Recordings that are shaky, poor audio and/or video quality, incomplete, or other issues will not be accepted, and the contractor will be responsible for providing a new recording and training within five (5) business days of notification. Provide a digital copy to the Owner and AV Consultant. If Digital copy is sent in a link, the link cannot have an expiration date and will be the responsibility of the contractor to maintain. Links shall be included in the Operating and Maintenance manuals in the first section.

### **3.9 CLEANING AND PROTECTION**

- A. Prior to final acceptance, the contractor shall vacuum and clean all system components and protect them from damage and deterioration. All general areas within and around all equipment rack/cabinets in the facility will be swept, vacuumed, and cleaned up.

**3.10 OPERATING AND MAINTENANCE MANUALS:** Refer to Section 26 0502 for requirements.

**3.11 RECORD DRAWINGS:** Refer to Section 26 0502 for requirements.

**END OF SECTION 27 5123**



## SECTION 27 5320

### PUBLIC SAFETY DAS/ERRCS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 26, 27, and 28, Specification Sections, apply to this Section.
- C. Refer to Appendix A – Hillcrest ES ERRCS/DAS System Preliminary Design
- D. 28 3111 Fire Detection and Alarm System

##### 1.2 ADMINISTRATIVE REQUIREMENTS:

- A. BNA Project Contact:
  - 1. Drayton Bailey – Principal
    - a. Phone: 801-532-2196
    - b. Email: drayton@bnaconsulting.com
- B. Bid Submittal:
  - 1. Equipment Costs: Breakout cost of material and labor as different line items. Refer to bid form for breakout cost requirements.
- C. Coordination:
  - 1. Coordinate final inspection of the systems installed, with Emergency Responders Radio Communication System (ERRCS) Consultant, three (3) weeks in advance.
  - 2. Obtain GANTT chart for construction time frame from the General Contractor.
  - 3. Coordinate with Electrical contractor to meet at least twice with the ceiling installer. Hold first meeting before submittal of shop drawings to coordinate the mounting condition of all ceiling-mounted ERRCS equipment with ceiling type. During second meeting, coordinate the location of all ceiling-mounted ERRCS equipment in each area.
  - 4. Meet with Electrical contractor prior to pathway rough-in to coordinate ERRCS requirements in each area.
  - 5. Meet at least once, prior to rough-in, with horizontal cabling installer to verify all ERRCS network requirements. Coordinate cable color according to specification 26 0553.
  - 6. Coordinate color and finish of all ERRCS components with Engineer.
- D. Contractor is responsible for coordinating with all other trades for equipment locations, mounting requirements, supports and plenum space requirements.
- E. ERRCS contractor shall participate in a mandatory pre-construction meeting no more than sixty (60) days prior to ordering equipment, and before work can begin. Contractor is responsible for coordinating the meeting. The meeting will be held at job trailer. All submittals, shop drawings and bills of materials shall be completed and submitted to Consultant for review eight (8) working days prior to this meeting.
- F. ERRCS contractor shall attend the electrical pre-construction meeting per specification 26 0500.

### 1.3 GENERAL SYSTEM REQUIREMENTS

- A. Public Safety DAS/ERRCS
  - 1. SUMMARY: This specification describes technical and performance criteria for deploying an Emergency Responders Radio Communication System (ERRCS) capable of supporting Public Safety Networks (PSN). Contractor shall provide a full turn-key solution and installation of the ERRCS as indicated per specifications.
  - 2. Division 26 and/or DAS Contractor is responsible for including all required contractors bids. Division 26 contractor is responsible for all pathway, power, and grounding requirements necessary for DAS system.
  - 3. 700/800 MHz ERRCS (Emergency Responders Radio Communication System)
- B. The DAS components typically specified include:
  - 1. Bi-Directional Amplifiers (BDA)
  - 2. Donor Antennas
  - 3. Coverage Antennas
  - 4. Coaxial Cable and Coax Connectors
  - 5. Splitters, Combiners, and Couplers
  - 6. Battery Backup Unit
- C. Planning shall include:
  - 1. Model projected antenna locations based upon floor plan layouts.
  - 2. Survey building conditions for signal coverage as building walls are built to verify antenna locations.
  - 3. Survey building conditions for signal coverage at building commissioning to verify there are no signal conflicts prior to building opening.
  - 4. Survey building conditions for signal coverage six (6) months after building is operational to ensure that there are no signal conflicts as building medical equipment has come online.
  - 5. All surveys are to be completed utilizing PCTel's Touch platform or equivalent.
- D. PSN Approval: The Contractor shall only propose and deploy a DAS system capable of receiving approval of the PSN Authority Having Jurisdiction (AHJ).
- E. Supervision and Monitoring:
  - 1. Provide the following outputs for monitoring by the Fire Alarm System. Connect these outputs to the fire alarm system for trouble monitoring:
    - a. Donor Antenna Malfunction
    - b. Signal booster Failure
    - c. Signal Booster Trouble.
    - d. Loss of AC Power
    - e. Failure of Charging Circuit
    - f. 70% of Battery Depletion

- F. Battery Backup: Provide a UPS capable of backing up the DAS system for a period of 24-hours.
- G. Mount antenna in an aesthetically pleasing manner.
- H. Provide plenum rated cabling throughout the entire system.
- I. Performance Requirements:
  - 1. The PSN DAS shall comply with local AHJ's code & requirement.
  - 2. The DAS shall deliver coverage of -95 dBm RSSI throughout 95% of all occupied building spaces and 99% in critical areas as defined in NFPA 72/1221 unless specified otherwise by the AHJ.
- J. Related Requirements
  - 1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section
  - 2. Division-7 Firestopping, apply to work of this section
  - 3. Division-26 Basic Materials and Methods sections apply to work specified in this section
  - 4. SECTION 27 1500 COMMUNICATIONS HORIZONTAL CABLING
  - 5. 2018 IFC SECTION 510
  - 6. 2019 NFPA 1221

#### **1.4 DEFINITIONS**

- A. AHJ: Authority Having Jurisdiction
- B. AWS: Advanced Wireless Service
- C. BC: Band Carrier
- D. BDA: Bi-Directional Amplifier
- E. BOM: Bill of Material
- F. BTS: Base Transceiver Station
- G. CDMA: Code Division Multiple Access
- H. CW: Continuous Wave
- I. DAS: Distributed Antenna System
- J. dB: decibel
- K. dBc: decibel relative to Carrier
- L. dBm: decibel relative to milliwatts
- M. DL: Downlink
- N. DTF: Distance-to-fault
- O. ERRCS: Emergency Responders Radio Communication System
- P. IFC: International Fire Code
- Q. LMR: Land Mobile Radio

- R. LTE: Long Term Evolution
- S. MHz: Megahertz
- T. MIMO: Multiple Input, Multiple Output
- U. PCS: Personal Communications System
- V. PIM: Passive intermodulation
- W. POI: Point of Interface
- X. PSN: Public Safety Network
- Y. RL: Return Loss
- Z. RSRP: Reference Signal Received Power
- AA. RSSI: Received Signal Strength Indicator
- BB. SINR: Signal-to-Noise Ratio
- CC. SISO: Single Input, Single Output
- DD. SMF: Single-mode Fiber
- EE. TRCES: Two-Way Radio Communications Enhancement System
- FF. UL: Downlink
- GG. UMTS: Uniform Mobile Telephone Service
- HH. VSWR: Voltage Standing Wave Ratio
- II. WCS: Wireless Communications Service
- JJ. WSP: Wireless service provider

## 1.5 SUBMITTALS

- A. Submittal Requirements
  - 1. Certificates:
    - a. An FCC-issued general radio operator license (GROL) is required to be held by the contractor.
    - b. A certificate from the manufacturer of the equipment to be installed stating that the DAS installer is trained or certified on the equipment.
  - 2. Test Equipment:
    - a. Submit certificates indicating that staff is certified on required test equipment including but not necessarily limited to:
      - 1) Signal Generators if required
      - 2) Spectrum Analyzers
      - 3) PIM Testers if required
      - 4) Scanner
    - b. Submit current calibration data for test equipment to be used.
  - 3. Bid Assumptions:
    - a. Contractors shall state the assumed channel count for the PSN Frequency Bands identified above with submittal of bid response. Prior to installation, contractors shall confirm the channel count and frequencies with the AHJ



and shall guarantee coverage for these channels per the criteria stated above.

B. Submittal Requirements Prior to Start of Construction:

1. Statement of Work (SOW): The contractor shall submit a SOW that has been accepted by the customer or customer's designated representative.
2. Acceptance Test Plan (ATP): The contractor shall submit an ATP that has been accepted by the customer or customer's designated representative.
3. The contractor shall explain the method used to avoid downlink and uplink interference.
4. Contractor will submit properly scaled floor plans showing the location of system Components:
  - a. Coordinate all antenna locations with the architect utilizing the reflected ceiling plan during the submittal process. All locations must be approved and may be changed during the submittal process to eliminate antenna in certain locations.
5. Final RF link budget
6. Detail Drawings for Donor Antenna and grounding.
7. RF propagation modeling (Heat maps)
8. Product Data Sheets for each type of equipment to be installed.
9. Maintenance Service Contract
10. Permit drawings as required by the AHJ.
11. Acquire permission to rebroadcast public safety signal from AHJ and provide documentation as proof.

C. Submittal Requirements at Close Out:

1. Drawings: Submit as-built drawings indicating:
  - a. Donor antenna, grounding and lighting protection details
  - b. Cable routing, splitters, couplers and coverage antenna locations
  - c. Active component locations, layout and configuration
2. Test Reports:
  - a. PSN: Submit Accepted ATP reports confirming the requirements have been meet.
3. Cable Test Reports: Submit cable test results for all cable segments. Testing shall include Return Loss (RL) and Distance to Fault (DTF).
4. Field Reports: Submit OTDR test results for all fiber runs.
5. Operation and Maintenance Data: Submit hardware and software manuals for all Active Components.
6. Acceptance Certificate or Document from the AHJ
7. Register the system with the FCC and provide documentation as proof.
8. Warranty Documents:
  - a. Submit for all manufactured components specified in this Section.

- b. Submit Contractor's System Warranty.
- c. Submit Manufacturer's Extended Warranty

## **1.6 GUARANTEE AND CERTIFICATE**

- A. Any item of material, apparatus, or equipment, furnished and installed, or construction by the Contractor showing defects in design, construction, quality or workmanship within two years from the date of final acceptance by the State shall be replaced by such new materials, apparatus or parts as may be found necessary to make such defective portion of the complete system conform to the true intent and meaning of the Specifications and Drawings. Contractor shall turn over all manufacturer's warranties to include 10, 15, and 25-year warranty programs for example.

## **1.7 DESCRIPTION OF WORK**

- A. The Contractor shall furnish all labor, materials (except as hereinafter noted), tools, equipment and appliances required to provide and install all Distributed Antenna System (DAS) Work, complete, as indicated on the drawings and as specified herein. The drawings note various sizes of equipment as determined for basis of design; the electrical work, however, shall be installed by qualified electrician to comply with the equipment manufacturer's installation requirements that are furnished by the successful supplier.
- B. The work shall include but not necessarily be limited to the following:
  - 1. Complete design and build of wireless communications infrastructure systems including: all RF and fiber vertical and horizontal cabling, connectors, splitters, couplers, antennas, fiber patch panels, fiber distribution panels and equipment racks; excluding: junction boxes, cable trays, weather heads, pull boxes and conduits required.
  - 2. Connector testing of terminated fiber and coaxial cabling and all active electronic equipment furnished and installed. Tested per manufacturers specifications for the following: RF multi-band sweep showing VSWR or Return Loss (in dB), DTF (distance to fault) and OTDR of fiber cabling showing total optical loss and reflection at 1310 and 1550nm wavelengths. All high voltage electrical connections, provided by others, will be tested for proper grounding and AC sinusoidal waveform compliance.

## **1.8 QUALIFICATIONS**

- A. Contractor shall have a minimum of 5 years documented experience in DAS design and deployment of cellular distributed antenna systems and over the air public safety wireless networks in which the last 3 years' experience to be submitted for review. All installers shall be required to have at least 3 years' experience and have certification by product manufacturer to be installed. Contractor and installer shall be certified by manufacturer and submit certification. Contractor must also have an iBwave 3 certified individual on staff as well as a general radio operators license (GROL).
- B. Key personnel assigned to the project shall each have minimum of (10) years of experience in completing systems equal to this scope, quality, type and complexity
- C. ERRCS installer shall be qualified to install the system per IFC (2018) Section 510.5.2
- D. All work shall be done by expert technicians qualified in the field with knowledge of specified systems. Workmanship shall comply with industry best practices concerning grounding, shielding, cable dressing, cable termination and equipment mounting.
- E. Bids submitted by non-approved installers will not be accepted.

- F. Bidders not pre-approved shall submit in writing the following for review at least (8) working days prior to bid:
1. List of qualifications including:
    - 1) Industries certifications including manufacturers.
    - 2) Approved resale manufacturers.
  2. Past and current projects within the last 5 years similar in scope and size.
  3. (3) Different referrals from the owners of (3) different projects within the last 5 years.

## **PART 2 - SYSTEM REQUIREMENTS**

### **2.1 FREQUENCY / BAND REQUIREMENTS**

- A. ERRCS shall support the following bands:
1. 700 MHz Band (Public Safety)
    - a. BC14 DL: 758-775 MHz
    - b. BC 14 UL: 788-805 MHz
  2. 800 MHz
    - a. DL: 851-862 MHz
    - b. UL: 806-817 MHz
  3. 700/800 MHz LMR with AT&T FirstNet

### **2.2 SYSTEM PERFORMANCE**

- A. ERRCS
1. Shall comply with IFC 510/NFPA1221.
  2. Coverage Requirement
    - A. DL DAQ shall be (3.0 DAQ) or greater throughout 95% of all areas.
    - B. DL DAQ shall be (3.0 DAQ) or greater throughout 99% of all critical areas, such as egress routes and stairwells

### **2.3 DAS MANUFACTURERS:**

- A. A. Subject to compliance with requirements, provide products by one of the following:
1. Approved DAS Active Components
    - 1) ERRCS
      - a. Nextivity (Basis of Design)
      - b. Wilson
      - c. Comba
      - d. Westell Technologies
  2. Approved DAS Passive Component Manufacturers (Refer to Specification 27 1500)
    - a. Single Mode Optical Cable

- i. General Cable
  - ii. Panduit
- b. CAT-6A Cable
  - i. General Cable
  - ii. Panduit
- c. Coaxial Cable
  - i. Commscope
  - ii. RFS
- d. Couplers/Splitters/Diplexers
  - i. Commscope
  - ii. Waveform
  - iii. Wilson
- e. Antennas
  - i. Commscope
  - ii. Laird
  - iii. Galtronics
  - iv. Nextivity

### **PART 3 - EXECUTION**

#### **3.1 FIBER OPTIC CABLING**

- A. Active distribution network requires single-mode fiber-optic cabling between system head end(s) and secondary distribution points.
- B. Contractor to provide armored SMF backbone with twelve (12) strands to each expansion node location, terminated in a wall or rack mount fiber panel with LC angled polish (LC/APC) connector terminations.
- C. All strands of each run shall be terminated at each expansion node location. Strands shall be terminated using core alignment fusion splicing of factory-polished APC connectors.
- D. Contractor to provide LC/APC to LC/UPC single-mode fiber-optic jumpers from fiber panel to DAS equipment.
- E. Contractor to provide innerduct or comparable protection for non-armored fiber-optic jumpers.
- F. EMT or GRC conduit will be installed where required in section 27 0528.

#### **3.2 DATA AND COAXIAL CABLING**

- A. For the ERRCS, the passive distribution network also requires coaxial cable between access points and antenna locations.
- B. Distribution network may require and/or CAT-6A between expansion nodes and antenna or wireless access point locations.
- C. GRC conduit will be installed where runs could be subject to vehicular impact.
- D. All cables shall be supported at a minimum separation interval not to exceed cable manufacturer's specification or Section 27 1500, whichever is more stringent.
- E. The use of shared communications/data cable raceways is permitted for DAS cabling.

- F. All new concrete cores' locations must be submitted to the Owner's staff for approval prior to drilling.
- G. GPR/XRAY must be used to avoid damage where required in section 27 0528.

### **3.3 SYSTEM COMPONENTS**

- A. Active and passive components shall be installed in accordance with the system design and with Manufacturer's recommended installation guidelines.
- B. All active and passive components shall be labeled with machine generated labels.

### **3.4 COMPONENT TESTING**

- A. Fiber-optic cabling
  - 1. SMF shall be tested in accordance with Section 27 1500 for each strand of SMF.
  - 2. All test results will be submitted for review.
- B. CAT-6A cabling (if used)
  - 1. All CAT-6A cabling shall be tested in accordance with Section 27 1500 and ANSI/TIA-568-C.2 standards.
  - 2. All test results will be submitted for review.
- C. Coaxial cabling
  - 1. All field terminated coaxial cables shall be Sweep tested.
  - 2. Return Loss (RL) testing, per segment of coax, for both low and high bands.
  - 3. Distance to Fault/Return Loss (DTF) testing, per segment of coax, for both low and high bands.
  - 4. Coax Sweep Testing Minimum requirements
    - a. Low Band sweeps will be set at 698-960 MHz
    - b. High Band sweeps will be set at 1710-2700 MHz
    - c. All tests shall be into a calibrated load terminator.
    - d. RL on any segment shall not exceed -18 dB
    - e. DTF/RL shall not exceed -24 dB
- D. Non-conforming work as covered in the General Conditions applies, but is not
- E. limited to the following:
  - 1. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced at no additional cost to the Owner.
  - 2. Any defect in cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced to ensure 100% useable conductors in all cables installed at no additional cost to the Owner.
  - 3. Correct deviation and repeat applicable testing at no additional cost to the Owner.
  - 4. Re-test cable(s) and provide new test data.
- F. CONTRACTOR TEST EQUIPMENT
  - 1. The contractor shall ensure all contractor supplied test equipment is properly calibrated, and certified. If requested by the Owner, the contractor shall be able to supply any certificates tied to the quality and calibration of the test equipment.

### **3.5 Locate equipment, antennas and splitters at locations shown on the contract drawings:**

- A. Extend cabling from the EOS enclosures to the splitters in a neat and orderly manner per the routing indicated on the contract drawings. Support cabling in compliance with NEC chapter 8 requirements and manufacturers recommendations.

- B. Maintain a 6" minimum distance from the DAS cabling and other cabling for parallel runs. Do not install coaxial cabling open in any areas where the cabling will be subject to physical damage.
- C. All locations must be approved prior to installation via the submittal process. When providing the layout of the antennae, locate antennae in back of house spaces whenever possible.

**3.6 EQUIPMENT MOUNTING:**

- A. Install wall mounted enclosures in telecommunication rooms in accordance with manufacturers instructions and seismic requirements.
- B. Provide and install equipment rack in main telecommunications room. Fasten to the floor per manufacturers instructions and provide seismic bracing.
- C. Install donor antennas per details shown on the contract documents.

**3.7 COORDINATION WITH OTHER TRADES:**

- A. Field coordinate the installation of the ERRCS headend equipment and remotes to ensure that each location is provided with the following:
  - 1. A dedicated 120V, 20A emergency circuit for UPS equipment served from the life safety generator system.
  - 2. (12) strands of single mode fiber from the head end location to each remote location terminated in LC/APC connectors.
  - 3. Grounding per NEC and TIA standards.
  - 4. Coordinate Alarm and Monitoring points with the Fire Alarm contractor.

**3.8 EXAMINATION:**

- A. The contractor must examine areas and conditions under which ERRCS components are to be installed and notify the owner's representative, in writing of those conditions which are, in the Contractor's opinion, potentially detrimental to proper completion of the work. The Contractor shall not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the owner.
- B. Examine pathway elements intended for cable, check raceways, cable trays and other elements for compliance with space allocations, installations tolerances, hazards to cable installation, and other conditions affecting installation. Proceed with installation only after unsatisfactory conditions have been corrected.
  - 1. Specific items of examination shall include, but shall not necessarily be limited to, the following:
    - a. Locations for all new ERRCS antennas, cable and splitter equipment.
    - b. The Contractor shall examine all rooms designated to house ERRCS equipment to ensure adequate space, power, and environment conditions to support installation.

**3.9 COMMISSIONING:**

- A. DAS commissioning will occur when head end DAS components are integrated and configured.
- B. Contractor shall submit a system commissioning and testing plan to the Owner prior to commissioning.
- C. Contractor shall submit certificate from the manufacturer of the equipment installed stating that the DAS installer is trained / qualified on the equipment.

**3.10 WARRANTY:**

- A. Splitters, Couplers, and Coverage Antennas: 5-year limited warranty from date of completion.
- B. Coaxial Cable and Connectors: 10 -year limited warranty from date of completion.
- C. Fiber-Optic Cable: 20-year limited warranty from date of system completion.
- D. Active Components: The earliest of 1-year limited warranty from date of completion.

**END OF SECTION 27 5320**

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**DIVISION 28 – ELECTRONIC SAFETY AND SECURITY**

Section 28 1600

Intrusion Detection System  
Specifications (DSC)

Section 28 2205

Access Control System Specifications  
(RBH)

Section 28 2300

IP Video Surveillance System (Rough-  
In and Cabling Only)

Section 28 3111

Fire Alarm and Detection System

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## SECTION 28 1600

### INTRUSION DETECTION SYSTEM

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26, 27 & 28 basic materials and methods sections apply to work specified in this section.
- C. Refer to specification 26 0553 for cabling, conduit, and junction box color requirements.
- D. Refer to specification 27 1500 for category and/or optical fiber cable and connectivity specifications and installation standards.
- E. All unshielded category 'UTP' and/or optical fiber cable, for security equipment, used on this project shall match the horizontal cabling within the building.
  - 1. Category cables used for transporting access controls simultaneously from panels or end devices shall follow the Manufacturer's recommended cabling specifications.
  - 2. Refer to and coordinate with specification 27 4100 for any access control equipment requiring UTP based category and/or optical fiber cabling and connectivity. Division 27 1500 shall provide installation and execution requirements for all category and/or optical fiber cabling and connectivity.

##### 1.2 ADMINISTRATIVE REQUIREMENTS:

- A. BNA Project Contact(s):
  - 1. Drayton Bailey  
Phone: 801-532-2196  
Email: Drayton@BNAConsulting.com
  - 2. Dan Varney  
Phone: 801-532-2196  
Email: DVarney@BNAConsulting.com

##### 1.3 DESCRIPTION OF WORK:

- A. Provide a complete and operational Intrusion Detection System; that will communicate to a certified central monitoring/reporting station; with all necessary material and labor to fulfill the requirement and the intent of the drawing and specifications. Any requirements not understood, or proposed deviances from these installation guidelines should be directed to and approved by the owner. Changes, adjustments, or deviations from this standard by the contractor that are not approved in writing by the owner are the sole responsibility of the contractor and may be ordered corrected at any time before or after completion of the job.
- B. The Intrusion Detection System (IDS) work is indicated by drawings and is hereby defined to include, but not be limited to, head-end control panel, power supplies, cabling, keypads, motion detector, glass breaks, shock sensors, smoke detectors, door contact, outlets, cover plates, backboards, grounding, and all miscellaneous items required for complete system.
- C. Provide the specified systems in a complete and operating condition with all necessary materials and labor to fulfill the requirements and the intent of the drawings and specifications. Except as otherwise indicated, provide manufacturer's standard system components. Contractor shall furnish all cables, materials, and equipment, whether specifically mentioned herein or not, to ensure a complete and functional system.
- D. Contractor is responsible for coordinating with all other trades for equipment locations, mounting requirements, supports and plenum space requirements.
- E. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section

- F. Refer to other Division-26 sections for requirements for raceways, trays, boxes, and fittings, and supporting devices, and other sections, as applicable.

**1.4 BID SUBMITTAL:**

- A. Provide a detailed scope of work document for all services provided.
- B. Submittals shall be submitted in a digital format with bookmarks for each section of equipment. Any submittals that are partial or incomplete shall be rejected and count as one submittal against the submittal allowance. No handwritten documentation is allowed.
- C. Provide a complete bill of materials for all components, accessories, and hardware to be provided in order to assemble a complete and working system as described within the contract documents.
- D. Provide a breakout cost of material and labor as different line items. Bids must include line-item pricing for major parts and components of the system.
- E. Submit manufacturer's data sheets and installation details for all devices, panels, cables, and head-end equipment. Product data showing multiple options, products and/or models shall be clearly marked identifying the specific options, products and/or models being provided.
- F. Submit manufacturer certifications for all systems provided. Certifications must be from local office providing the installation.
- G. All change orders will be required to have the same discounts on equipment than original bid. And follow the above information for all change orders.

**1.5 QUALITY ASSURANCE:**

- A. **MANUFACTURERS:** Firms regularly engaged in manufacture of security system equipment and components of the types described here-in and whose products have been in satisfactory use in similar applications for not less than 5 years.
- B. Bidders wishing to provide equipment other than the equipment specified shall submit proposed substitute equipment to Security Consultant (8) working days prior to bidding. Submittals for prior approval shall include description of equipment, design intent, complete riser diagrams for proposed equipment, equipment specifications, cut sheets of proposed equipment, reason for alternate equipment. Security Consultant may request physical equipment to test and demo. Acceptance of proposed equipment by Security Consultant shall not relieve security contractor from responsibility to provide systems equal to those specified in this Section. Contractor shall be ultimately responsible for providing complete and working system that function, control and operate in the same manner as the specified equipment. Security Consultant has final say if proposed equipment is equal to the specified equipment. Equipment that Security Consultant is not familiar with will require the contractor to provide manufacturer training at manufacturer's facility and have a manufacturer representative present at time of commissioning.
- C. Installation Contractor:
- D. Integrating firm shall have worked satisfactorily for a minimum of (5) years of completing systems equal to this scope, quality, type, and complexity.
  - 1. Key personnel assigned to the project shall each have minimum of (5) years of experience in completing systems equal to this scope, quality, type, and complexity.
  - 2. Contractor shall be a factory authorized installer of all equipment specified for the geographical area of the project.
  - 3. Contractor shall maintain complete installation and service facilities for the duration of the project contract.
  - 4. Contractor shall have current manufacturer certifications for all security systems and equipment listed within this specification. Certifications must be from local office providing the install.

- E. All work shall be done by expert technicians qualified in the field with knowledge of specified systems. Workmanship shall comply with industry best practices concerning grounding, shielding, cable dressing, cable termination and equipment mounting.
- F. All technicians are required to have proper state licensing to perform work within this specification.
- G. Pre-Approved Installation Contractor(s):
  - 1. Open to State Licenses and Manufacturer Certified Contractors
- H. Bidders not pre-approved: Bidders that are not on this pre-approved list shall submit in writing the following for review at least (8) working days prior to bid.
 

List of qualifications include:

  - 1. Industries certifications including manufacturers.
  - 2. Past and current projects within the last 5 years similar in scope and size.
  - 3. (3) Different referrals from the owners of (3) different projects within the last 5 years.

**1.6 WARRANTY AND SERVICE:**

- A. The minimum warranty period shall be three (3) years, the warranty period will begin when the system completion documents are submitted to the owners and the system has successfully passed all tests and inspections. Included in the completion documents will be a warranty and service contact form, this form will be filled out by the burglar alarm contractor, all necessary contact information shall be included to guarantee a response to the system site within 24 HOURS OF THE REQUEST FOR SYSTEM SERVICE. Only qualified technicians capable of making needed repairs and/or system programming are accepted to respond for service.

**PART 2 – WIRING**

**2.1 RACEWAYS:**

- A. All system wiring shall be contained in a metal raceway, conduit, j-hooks, or a listed enclosure. All raceways and enclosures shall be securely fastened and/or mounted as per the currently adopted version of the National Electrical Code (NFPA 70). All work must be completed in a neat and workmanlike manner. Regular electrical inspections are required and shall be scheduled by the contractor through the school districts construction services department at least twenty-four hours in advance.

**2.2 WIRING SPECIFICATIONS:**

- A. All Security cable jackets shall be either all yellow, green, or purple, UL Listed, and Plenum Rated, and approved by the owner.
- B. ALL system wiring (except line voltage and telephone connections) shall be minimum 18 AWG stranded, Plenum, copper cable.
- C. Telephone connections shall be minimum CAT 6 Plenum and connect to panel telephone line connection terminals via an RJ31X telephone jack and cord. Direct wiring of telephone lines to panel circuit board is not acceptable.

**2.3 WIRE COLOR CODE:**

- A. Wire conductor colors for any circuits not listed below shall be approved by owner prior to starting any work:
  - 1. Keypad(s): Red, Black, Yellow, Green
  - 2. Door / Window / Roof Hatch Contact(s): Yellow, Green
  - 3. Motion Detector(s): Red, Black, Yellow, Green
  - 4. Glass Break(s): Red, Black, Yellow, Green
  - 5. Smoke / Heat / CO Detector(s): Red, Black, Yellow, Green
  - 6. Com-Bus Circuit: Red, Black, Yellow, Green
  - 7. Siren / Strobe: Red, Black
  - 8. Duress / Panic / Hold-Up Button(s): Red, Black, Yellow, Green
- B. WIRING: Provide the following wiring for the security system components:

1. Keypad: UL Listed, 22 AWG 4 Conductor Stranded, Plenum(if applicable)
2. Door / Window / Roof Hatch Contact: UL Listed, 22 AWG 2 Conductor Stranded, Plenum(if applicable)
3. Motion Detector: UL Listed, 18 AWG 4 Conductor Stranded, Plenum(if applicable)
4. Glass Break: UL Listed, 18 AWG 4 Conductor Stranded, Plenum(if applicable)
5. Smoke / Heat / CO Detector: UL Listed, 18 AWG 4 Conductor Stranded, Plenum(if applicable)
6. Com-Bus Circuit: UL Listed, 18 AWG 4 Conductor Stranded, Plenum(if applicable)
7. Siren / Strobe: UL Listed, 18 AWG 2 Conductor Stranded, Plenum(if applicable)
8. Duress / Panic / Hold-Up Button: UL Listed, 22 AWG 4 Conductor Stranded, Plenum(if applicable)

**PART 3 – APPROVED MANUFACTURES AND END DEVICES:**

**3.1 AUTHORIZED MANUFACTURE(S):**

- A. DSC

**3.2 MOTION DETECTORS:**

- A. Accepted motion detector manufacturers are, Bosch, Takex, Detection Systems, Bosch, Pulnix and Optex. Motion detector model and type must be approved by the owner before installation. Motion detection coverage is required at every building entrance (excluding windows), every hallway intersection and inside all main office areas. Additional motion detector coverage may be required, and system layout shall be approved by the owner before installation. Each motion detector shall be independently zoned and device wiring shall be home run to control panel or zone expander location. Loop supervision resistors shall be installed inside the motion detector. Motion detectors shall be wired to monitor for device trouble and tamper when so equipped.
- B. Mount security devices a minimum of 3 feet from heat or air movement sources.

**3.3 DOOR CONTACTS:**

- A. Accepted door and overhead/roll up garage contact manufacturers are Bosch, Nascom, GRI, Magnasphere, Edwards Signaling, Tane, and Honeywell. Accepted models should match the door frame color as closely as possible.
- B. Loop supervision resistors shall be installed as close to the door contact as possible. All door contacts shall be independently zoned and device wiring shall be home run to control panel or zone expander location. When B type wire connectors are used, they shall be silicone filled or connections are required to be soldered.

**3.4 DURESS/HOLD UP:**

- A. Duress/Hold-Up type signals will neither be audible nor visible but will contact the central monitoring station of the emergency.
- B. Some accepted manufactures for the duress buttons are Honeywell (269R), and the Potter (Husk-20).

**3.5 SIREN SOUNDER/STROBE:**

- A. Accepted manufactures for the Siren/Horn and Strobes are Amseco, Potter, ATW Security, Kidde-Edwards, Federal Signal Corp, Macurco, and Potter.

**3.6 SYSTEM BATTERY:**

- A. All system batteries shall be Yuasa, PowerSonic, or Elk brand. Minimum standby capacity shall be 24 hours, battery calculations to verify system standby time are required.

**3.7 SYSTEM TRANSFORMER:**

- A. Outlets shall be duplex type with one duplex outlet for each required transformer. Transformer shall connect to outlet using the anchoring screw provided with transformer.

## **PART 4 – INSTALLATION REQUIREMENTS:**

### **4.1 CONTROL AND AUXILIARY EQUIPMENT:**

- A. Install security system as indicated, in accordance with equipment manufacturers written instructions, and with recognized industry practices, to ensure that system equipment complies with requirements. Comply with requirements of NEC, and applicable portions of NECA's "Standards of Installation" practices.
- B. Coordinate all equipment locations and mounting details with other trades and suppliers.
- C. System enclosures shall be surface mounted 72" AFF to the top off enclosure and installed only after all wallboard and painting work is complete. All wiring shall enter system enclosures through minimum 1 ¼" nipple located on the top far right-hand side of the enclosure. Plastic bushings are required on all nipples.
- D. Provide a minimum of one duplex receptacle on dedicated emergency powered circuit adjacent to each terminal backboard or cabinet.
- E. Mounting: Coordinate & verify each device mounting with the owner(s). Mount security devices a minimum of 3 feet from heat or air movement sources.
- F. Grounding: Provide grounding connections sufficiently tight to assure permanent and effective ground.
- G. Testing: Upon completion of installation of system and after energized, demonstrate system compliance with intent.
- H. Labeling: The contractor shall develop and submit for approval a labeling system for the cable installation. Coordinate with the owner and negotiate an appropriate labeling scheme with the contractor. At a minimum, the labeling system shall clearly identify all components of the system: racks, cables, panels, and wall plates. The labeling system shall designate the cables origin and destination and a unique identifier for the cable within the system. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme.
- I. All labels shall meet UL 969 requirements for legibility, defacement, and adhesion requirements. Handwritten labels are not allowed. All labels shall maintain consistent typeface, size, and color.

### **4.2 OPERATING, MAINTENANCE MANUALS, TESTING, CYBER SECURITY & TRAINING:**

- A. The security contractor will terminate, program and test control equipment. As built drawings shall be provided to district personnel before commissioning shall begin. System loops will be tested, and any fault conditions found shall be corrected immediately by the contractor.
- B. Provide a minimum of two sessions of two hours training on the operation and installation of Intrusion system at job site. Ensure the owner is proficient in the control of the system with contact information readily available.
- C. Contractor shall provide a 3-month follow-up with the end user.
- D. The contractor shall furnish two maintenance and operating manuals to owner prior to testing of systems.
- E. Operating instructions outlining the step-by-step procedures required for system start-up, operation, and shutdown shall be submitted prior to testing of system. The instructions shall include the manufacturer's name, system model number, service manual, parts list, instructions, and a description of all equipment and their basic operating features.
- F. Contractor shall change all default username and passwords for all network devices provided. A Strong Password should -
  - 1. Be at least 8 characters in length
  - 2. Contain both upper and lowercase alphabetic characters (e.g., A-Z, a-z)
  - 3. Have at least one numerical character (e.g., 0-9)
  - 4. Have at least one special character (e.g., ~!@#%&\*()\_-+=)
- G. No written username or passwords shall be located in any areas of installation.
- H. Network devices to be set up on a separate network other than owner's LAN ensuring no internal or external users can access system without authorization. Follow

manufacturers hardening guide and use best industry practices to secure network and devices provided by contractor and associated with system.

**END OF SECTION 28 1600**



**SECTION 28 2205**  
**ACCESS CONTROL SYSTEM**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS:**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26, 27 & 28 basic materials and methods sections apply to work specified in this section.
- C. Refer to specification 26 0553 for cabling, conduit, and junction box color requirements.
- D. Refer to specification 27 1500 for category and/or optical fiber cable and connectivity specifications and installation standards.
- E. All unshielded category 'UTP' and/or optical fiber cable, for security equipment, used on this project shall match the horizontal cabling within the building.
  - 1. Category cables used for transporting access controls simultaneously from panels or end devices shall follow the manufacturer's recommended cabling specifications.
  - 2. Refer to and coordinate with specification 27 4100 for any access control equipment requiring UTP based category and/or optical fiber cabling and connectivity. Division 27 1500 shall provide installation and execution requirements for the category cabling, the optical fiber cabling, and the connectivity.
- F. Definitions:
  - 1. ACS: Access Control System
  - 2. CSA: Client Software Application
  - 3. UI: User Interface
  - 4. OSDP: Open Supervised Device Protocol
  - 5. UPS: Uninterruptible Power Supply
  - 6. CR: Credential Card Reader
  - 7. DPS: Door Position Switch
  - 8. REX: Request to Exit
  - 9. DR: Momentary Door Release Button
  - 10. AD: Active Directory

**1.2 ADMINISTRATIVE REQUIREMENTS:**

- A. BNA Project Contact(s):
  - 1. Drayton Bailey  
Email: Drayton@BNAConsulting.com  
Phone: 801-532-2196
  - 2. Dan Varney

Email: DVarney@BNAConsulting.com

Phone: 801-532-2196

### 1.3 DESCRIPTION OF WORK:

- A. Provide a complete and operating access control system as indicated in the drawings and plans, and is hereby defined to include, but not be limited to - access control head-end control panels, power supplies, credential card readers, door position switches, request to exit motions, momentary door release buttons, duress/panic switches, two-way audio/video intercom door stations, credential badge printer, credentials, raceway, outlets, cover plates, jacks, backboards, cabinets, grounding, protective enclosures, and all wiring that is normally and reasonably required.
- B. Contractor will need to provide all of the necessary equipment and programming to integrate the access control system to operate with the video surveillance system, the DSC intrusion detection system, the Aiphone two-way audio/video intercoms, the momentary door release buttons, the duress/panic lockdown buttons, the school district SIP/VoIP phone system, and the Rauland TCU intercom system, so they all work as a unified system.
- C. Provide the specified system in a complete and operating condition with all necessary materials and labor to fulfill all the requirements and the intent of the drawings and specifications. Except as otherwise indicated, provide manufacturer's standard system components.
- D. Contractor shall furnish all cables, materials, and equipment, whether specifically mentioned herein or not, to ensure a complete and functional system.
- E. Contractor is responsible for coordinating & verifying with other trades, and the school district for equipment locations, mounting requirements, supports, and plenum space requirements.
- F. Refer to other Division 26 sections for requirements for raceways, trays, boxes, and fittings, and supporting devices, and other sections, as applicable.
- G. Connect the access control system to the intercommunications system such that upon activation of an emergency lockdown or preventative lockdown from the administrative console, web browser, or app a communication protocol will be sent from the intercom system to the access control system that will allow for all controlled doors to be locked, a designated campus wide communication throughout the building, emails, SMS text, etc. A minimum of two types of initiations process shall be programmed e.g., "Emergency Lockdown or "Preventative Lockdown" In addition, the contractor shall provide all controls necessary between the two systems such that the system can easily be reprogrammed to meet the needs of the school district.

### 1.4 BID SUBMITTAL:

- A. Provide a detailed scope of work document for all services provided.
- B. Submittals shall be submitted in a digital format with bookmarks for each section of equipment. Any submittals that are partial or incomplete shall be rejected and count as one submittal against the submittal allowance. No handwritten documentation is allowed.
- C. Provide a complete bill of materials for all components, accessories, and hardware to be provided in order to assemble a complete working system as described within the contract documents.
- D. Provide a breakout cost of material and labor as different line items. Bids must include line-item pricing for major parts and components of the system.
- E. Submit manufacturer's data sheets and installation details for all devices, panels, cables, and head-end equipment. Product data showing multiple options, products and/or

models shall be clearly marked identifying the specific options, products and/or models being provided.

- F. Submit manufacturer certifications for all systems provided. Certifications must be from local office providing the installation.
- G. All change orders will be required to have the same discounts on equipment than original bid. And follow the above information for all change orders.

#### **1.5 COORDINATION:**

- A. Coordinate final inspection of the systems installed, with Security Consultant, three (3) weeks in advance.
- B. Obtain GANTT chart for construction time frame from the General Contractor.
- C. Coordinate with the school district, the DiV.8 contractor, and the electrical contractor PRIOR to rough-in to coordinate exact location of end devices and door functionality.
- D. Meet with electrical contractor prior to pathway rough-in to coordinate access control system requirements in each area.
- E. Coordinate a meeting with school district IT department prior to ordering equipment to verify IT requirements and standards.
- F. Meet at least once, prior to rough-in, with horizontal cabling installer to verify all AV network requirements. Coordinate cable color according to specification 26 0553.
- G. Coordinate color and finish of all access control components with architect or electrical contractor as appropriate.
- H. Division 26, 27, and 28 contractors shall verify electrical service provided prior to ordering any electrical equipment serving electronic door hardware equipment and has the final responsibility for properly coordinating the electrical work, including the exact location of the electrical connection(s).
- I. Obtain submittals of all door hardware equipment from door hardware specification and Division 8 and 28 contractor(s). Carefully review door hardware submittal and advise in writing of any discrepancies.
- J. Notify engineer of any modifications between contract documents and submittals. It is the contractor's responsibility to ensure compliance with the documents.
- K. The contractor shall include necessary wiring and programming for fire-alarm panel tie-in and door release based upon the requirements and direction of the school district and/or AHJ. Contractor is responsible to schedule and coordinate with the fire alarm contractor.
- L. Coordinate all interfaces between door hardware and electrical contractor.
- M. Provide dedicated 20-amp circuits for the access control panels, equipment, and the electrified door hardware power supplies.
- N. Coordinate with the school district and the electrical contractor and review what electrical circuits the active access control head end control panels and the electrified door hardware power supplies will need to be connected to (i.e., emergency backup power circuits, or standard dirty power circuits).
- O. A licensed and insured Electrical Contractor to provide 120VAC power to all locations requiring power.

#### **1.6 QUALITY ASSURANCE:**

- A. Manufactures: Firms regularly engaged in manufacture of security system equipment

and components of the types described here-in and whose products have been in satisfactory use in similar applications for not less than 5 years.

- B. Bidders wishing to provide equipment other than the equipment specified shall submit proposed substitute equipment to Security Consultant (8) working days prior to bidding. Submittals for prior approval shall include description of equipment, design intent, complete riser diagrams for proposed equipment, equipment specifications, cut sheets of proposed equipment, reason for alternate equipment. Security Consultant may request physical equipment to test and demo. Acceptance of proposed equipment by Security Consultant shall not relieve security contractor from responsibility to provide systems equal to those specified in this Section. Contractor shall be ultimately responsible for providing complete and working system that function, controls, and operate in the same manner as the specified equipment. Security Consultant has final say if proposed equipment is equal to the specified equipment. Equipment that Security Consultant is not familiar with will require the contractor to provide manufacturer training at manufacturer's facility and have a manufacturer representative present at time of commissioning.
- C. Installation Contractor:
1. Integrating firm shall have worked satisfactorily for a minimum of five years of completing systems equal to this scope, quality, type, and complexity.
  2. Key personnel assigned to the project shall each have minimum of five years of experience in completing systems equal to this scope, quality, type, and complexity.
  3. Contractor shall be a factory authorized installer of all equipment specified for the geographical area of the project.
  4. Contractor shall maintain complete installation and service facilities for the duration of the project contract.
  5. Contractor(s) must be a manufacture authorized dealer and have current manufacturer certifications for the access control system and equipment listed within this specification. Certifications must be from local office providing the installation.
- D. All work shall be done by expert technicians qualified in the field with knowledge of specified systems. Workmanship shall comply with industry best practices concerning grounding, shielding, cable dressing, cable termination and equipment mounting.
- E. All technicians are required to have proper state licensing to perform work within this specification.
- F. State Licensed and Manufacture Certified Pre-Approved Installation Contractor(s):
1. *Pro Edge Technology, LLC – Jared Roper*  
*Phone: 801-645-1908*  
*Email: jared@proedgetech.net*
  2. *Powered Control System – Nelson Powers*  
*Phone: 801-576-6634*  
*Email: nelson@poweredcontrolsystems.com*
- G. Bidders not pre-approved: Bidders that are not on this pre-approved list shall submit in writing the following for review at least (8) working days prior to bid.
- List of qualifications include:
1. Industries certifications including manufacturers.
  2. Past and current projects within the last five years are similar in scope and size.
  3. Provide three different referrals from owners of three different projects within the

last five years.

## 1.7 SUBMITTALS:

- A. Refer to specification 26 0500 for shop drawing submittal requirements. The following items shall be included in the shop drawings submittal. Submittals to be reviewed and approved prior to ordering equipment.
  - 1. All submittals shall be submitted in a digital format with bookmarks for each section of equipment. Any submittals that are partial or incomplete shall be rejected and count as one submittal against the submittal allowance. No handwritten documentation is allowed.
  - 2. Provide a complete bill of materials for all components, accessories, and hardware to be provided in order to assemble a complete working system as described within the contract documents.
  - 3. Submit manufacturer's data and installation details for all devices, panels, cables, and head-end equipment. Product data showing multiple options, products and/or models shall be clearly marked identifying the specific options, products and/or models being provided.
  - 4. Submit dimensioned drawings and device wiring layouts for all equipment.
  - 5. Submit equipment rack elevation diagrams (if applicable).
  - 6. Submit network switch port count and power requirements. Port count and POE switch requirements should be broken out per IDF/MDF closet.
  - 7. Submit manufacturer certifications for all systems provided. Certifications must be from local office providing the installation.
- B. Provide a detailed scope of work document for all services provided.
- C. Provide the school district the following upon project completion:
  - 1. A complete set of shop drawings indicating: Locations of all access control head-end panels, power supplies, end devices, and point-to-point wiring diagrams for all devices.
  - 2. A complete equipment list identifying the type, make, model, manufacturer, and the manufacturer's product data cut sheets for each item.
  - 3. A list of IP and MAC addresses, username and passwords for network devices coordinated with door name and/or location.
  - 4. Serial and model numbers for all major components.
  - 5. Installation manuals and user manuals for all systems listed in these specifications.

## 1.8 WARRANTY:

- A. Systems shall be guaranteed for a period of one year from the date of substantial completion against defective materials, inferior workmanship, or improper installation adjustment. Guarantee shall cover all parts and labor.
- B. If system failure causes access control system to be inoperative or unusable for its intended purpose, contractor, when notified of the problem, shall repair system so it will be operational and usable within three business days. If defective components cannot be repaired in time, provide temporary equipment as required.
- C. Systems designed for 24/7 operation shall be repaired and/or replaced within 24 hours of time of notification. If defective components cannot be repaired in time, provide temporary equipment as required.

- D. Contractor shall supply a one-year warranty on all system programming from the date of substantial project completion. During this time period, upon the school district request, the contractor shall provide programming changes up to four times or four hours free of charge.
- E. Contractor shall honor equipment warranties for term established by manufacturer if greater than warranty time frame mentioned above.

## **PART 2 – PRODUCTS**

### **2.1 GENERAL REQUIREMENTS:**

- A. Provide a complete and a fully functioning RBH proprietary access control system that meet the school district's requirements, operates to the manufacture specifications, and maintains building security.
- B. The access control operating system shall be the RBH Access Technologies AxiomV Enterprise solution.
- C. Systems installed shall allow seamless integration and operate with one another (Access Control System - Video Surveillance System – DSC Intrusion Detection System – Aiphone Two-Way Audio Video Door Station Intercoms – School Districts SIP/VoIP Phone System – Rauland TCU Intercom System).
- D. The ACS shall be scalable to support configurations consisting of thousands of doors with facilities spanning multiple geographic areas.
- E. The network appliance shall be capable of running on an existing TCP/IP network and shall be accessible, configurable, and manageable from any network-connected PC with a browser and/or client.
- F. The ACS shall support a variety of access control functionalities, including but not limited to:
  - 1. Elevator management
  - 2. Cardholder and cardholder group management, credential management, and access rule management.
  - 3. Badge printing and template creation.
  - 4. Visitor Management.
  - 5. Mustering.
  - 6. LDAP / Active Directory integration for single-user logon authentication.
  - 7. Access levels disable for immediate lockdown.
  - 8. A completely customizable access level based on threat levels, multiple schedules, and user groups.
  - 9. The ACS shall support encrypted reader to panel communications using the SIA OSDP protocol.
- G. All equipment shall be installed as shown on the drawings and in strict accordance with the specifications. Any errors, conflicts, or omissions discovered in the specifications, or drawings, shall be submitted in writing to the Security Consultant for clarification in an RFI.
- H. Equipment lists are provided to set equipment expectations and may not be complete. Coordinate with devices shown on drawings for system intent. Provide a complete and functional system as described within the construction documents

**2.2 AUTHORIZED MANUFACTURER(S):**

A. *RBH AXIOM*

**2.3 GENERAL EQUIPMENT REQUIREMENTS:**

A. Provide all necessary equipment to ensure a complete access control system is achieved. Provide the following equipment as a baseline for the access control system:

1. Access Control Head-End Equipment/Panels

| <u>Description</u>                       | <u>Manufacturer</u>          | <u>Part Number</u> |
|--|------------------------------|--------------------|
| Access Control Server                    |                              | Per manufacturer   |
| Operating Software                       | RBH                          | AxiomV Enterprise  |
| Universal Network Controller             | RBH                          | UNC100             |
| Universal Network Controller             | RBH                          | UNC-500            |
| Input / Output Controller                | RBH                          | IOC16M             |
| Reader Controller                        | RBH                          | RC2M               |
| ASCII Gateway                            | RBH                          | PC-100             |
| LAN TCP/IP Gateway                       | RBH                          | LIF-200            |
| Exit Reader Module                       | RBH                          | TBH-EXITRDR        |
| Input / Output Controller                | RBH                          | IOC8               |
| Controller Board Enclosures              | RBH                          | ENCL-1, ENCL-2     |
| Controller Board Enclosures              | RBH                          | ENCL-1PS, ENCL-2PS |
| Electrified Door Hardware Power Supplies | LifeSafety Power or Altronix |                    |
| 12V 8Ah Rechargeable Backup Battery      | UPG                          | UB1280             |

2. End Devices

|   |                  |                           |
|---|------------------|---------------------------|
| Single Gang Card Reader                       | HID-Signo 40     | 40NKS-02-000000           |
| Mullion Card Reader                           | HID-Signo 20     | 20NKS-02-000000           |
| Door Position Switch/Contact (DPS)            | Bosch            | ISN-CSD70 (or equivalent) |
| Request to Exit Motion (REX)                  | Bosch            | DS160                     |
| Request to Exit Motion Trim Plate             | Bosch            | TS160                     |
| Momentary Door Release Button                 | SDC              | DTMO-2 (desktop button)   |
| Duress / Panic Button                         | Honeywell        | 269R                      |
| Lockdown Button                               | Bosch ND 100 GLT | ISC-PB1-100               |
| Lockdown Button Cover                         | Bosch            | 3902115343                |
| Two-Way Audio/Video IP Intercom Door Stations | Aiphone          | IX-DVF, IX-DVM            |
| Master Station                                | Aiphone          | IX-MV7-HB                 |
| Emergency or Push To Exit Button              | Securitron       | EEB (or equivalent)       |

B. Equipment lists are provided to set equipment **expectations** and may not be complete. Coordinate with devices shown on drawings, system risers, and equipment list for system intent. The contractor is responsible to provide a complete and functional access control system as described within the construction documents.

1. DIV.8 to supply and install electrified door hardware (electric strikes, exit rim

device/crash bars, maglocks, electric locksets).

2. DIV.28 to provide and install all integrated credential card reader / electrified lockset combinations.
3. DIV.8 to supply the door position contacts, and DIV.28 to install the door position contacts.
4. DIV.28 shall provide all of the power supplies for electrified door hardware equipment. Coordinate & verify with DIV.8 the exact power requirements.
5. DIV.28 and DIV.8 contractors are to coordinate, discuss, and verify with the architect, the school district, and the electrical contractor all of the door hardware equipment that is going to be provided & installed.
6. Provide 1 year of software updates for access control software.

#### **2.4 POWER SUPPLIES:**

- A. The DC Voltage power supply shall provide dual output fused ports of either 12 or 24VDC and receive power inputs of either 120 or 230VAC. Power units shall be expandable by adding additional modules for up to three power modules. Power modules shall provide power capabilities from 75 to 250W. The system shall provide configurations for; power distribution, control and signaling, fire alarm interface or fail safe/fail secure locking control and shall be a standard feature of the system.
- B. Power supplies shall be located by the head-end access control panel(s). Provide additional enclosures as needed.
- C. Power supplies and access control panels should have a minimum of two 12VDC 8AH batteries per panel.
- D. A network module shall be available as an optional device for remote functionality such as control, status reporting, information logging, remote battery testing, fault reporting / restore, and shall interface with multiple control and monitoring modules to extend the remote functionality to multiple individual outputs for direct control, extended information gathering and reporting.
- E. The DIV.28 contractor shall provide power supplies for the electrified locks, access control panels, and any other access control devices needing power.
- F. Minimum standby capacity shall be 24 hours, battery calculations to verify system standby time are required.
- G. Coordinate with the electrical contractor and the school district and review what electrical circuits the active access control head-end control panels and the electrified door hardware power supplies will need to be connected to (i.e., emergency backup power circuits, or a standard circuits).

#### **2.5 CREDENTIAL CARD READERS:**

- A. The contactless smart card reader shall comply with the following 13.56MHz-related standards: ISO 15693, ISO 14443A, ISO 14443B
- B. The card reader shall be configurable to provide secure, bidirectional communication in compliance with v2 of the SIA Open Supervised Device Protocol (OSDP).
- C. The contactless smart card reader shall utilize an EAL5+ certified secure element to protect keys and execute cryptographic functions. It shall support 3DES and AES algorithms.
- D. The contactless smart card reader shall support secure sector read of iCLASS SeoS credentials and Mobile Identities powered by SeoS.
- E. The contactless smart card reader must support Bluetooth Low Energy (BLE) and Near



- Field Communication (NFC) communication technologies.
- F. Optionally the reader shall support 125kHz HID Prox credentials.
  - G. Mobile Identity operation must be configurable.
  - H. The contactless smart card reader shall provide enhanced user feedback options through the use of tri-colored LEDs configurable to support any three-color combinations (RGB - Red, Green, and Blue).
  - I. Reader behavior configuration options shall include Intelligent Power Management (IPM) mode to reduce power consumption by at least 59%.
  - J. The Contactless smart card reader shall be connected with pigtail cable
  - K. Tamper detection on card readers shall be programmed to send notification through access control system in the event of damaged or tampered with.
  - L. Card readers must have the capability to support mobile phone credentials if the school district chooses to upgrade to mobile credentials in the future.
  - M. Card readers are to be mounted on a 4 square j-box with a single gang mud ring. Mullion style card readers that are mounted onto mullions do not need back box; wiring should be routed though mullion/door frame.

### **PART 3 – EXECUTION**

#### **3.1 INSTALLATION OF ACCESS CONTROL SYSTEM:**

- A. General: Install access control system as indicated, in accordance with equipment manufacturers written instructions, and with recognized industry practices, to ensure that system equipment complies with requirements. Comply with requirements of NEC, and applicable portions of NECA's "Standards of Installation" practices.
- B. Prior to starting any work, coordinate and verify the access control layout, wiring, equipment device locations, and mounting details with the school district, the architect, and any other trades and suppliers that are applicable, and get written approval.
- C. Coordination Meetings:
  - 1. Meet at least twice with the door hardware systems installer. Hold first meeting before submittal of shop drawings to coordinate electronic door hardware components for each door, rough-in requirements, door schedules. Hold the second prior to the physical installation of components to verify raceway and cabling, equipment list, verify any and all changes have been accounted for, and verify site conditions for each area.
  - 2. Review and coordinate access control system layout and wiring with the school district.
- D. Device Mounting: Mount access control devices a minimum of 3 feet from heat or air movement sources.
- E. Network Devices: Provide network cable(s) to any networked devices for access control system and coordinate terminations.
- F. Grounding: Provide grounding connections sufficiently tight to assure permanent and effective ground.
- G. Testing: Upon completion of installation of system and after energized, demonstrate system compliance with intent.
- H. Wiring & Terminations: All components of this system will need to be in accordance with the manufacture's specifications & recommendations. All final connections shall be made by a qualified & certified technician familiar with the manufactures equipment and

adhering to the school district's procedures.

- I. On-Site Equipment: Contractor is required to provide their own equipment unless they have written permission from the school district to use any of the school district's equipment (lifts, ladders, tools, etc.) onsite. It is the contractor's responsibility to provide all equipment costs in their proposals.
- J. Zoning: Each detector, door position switch, and sensing device shall be considered a location. Multiple doors at a common entry can be considered one location. The system shall be programmed to log and detect individual status of a monitored door based on a schedule. Doors with a door contact must have the ability to receive alerts for that specific opening if the door is opened during a certain time and/or left open for a specific time (60 seconds).
- K. Labeling: The contractor shall develop and submit for approval a labeling system for the cable installation. Coordinate with the school district and decide on an appropriate labeling scheme with the contractor. At a minimum, the labeling system shall clearly identify all components of the system: racks, cables, panels, and wall plates. The labeling system shall designate the cable's origin and destination and a unique identifier for the cable within the system. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme.
  - 1. All labels shall meet UL 969 requirements for legibility, defacement, and adhesion requirements. Handwritten labels are not allowed. All labels shall maintain consistent typeface, size, and color.
  - 2. Provide laminated plans (minimum size 11x17) of all Security Systems as-built plans (including riser diagrams) at each telecom room/panel location.
- L. Occupancy Adjustments: When required within 1 year of date of substantial completion, provide on-site assistance in adjusting and reprogramming to suit actual occupied conditions. Provide 1 visit to the site for this purpose without additional cost.
- M. Mounting Height: Credential card readers and intercoms should meet all ADA mounting requirements. Credential card readers shall be mounted 48" from the floor to the top of the card reader.
- N. Roof Hatches: Verify each roof hatch location with the school district and install door position switches/contacts on each one. Each roof hatch door position switch/contact shall be tied into the access control system that will provide a scheduled notification when opened.
- O. Request to Exit Motions: Request to exit motions should be mounted above the door frame onto a single gang horizontally mounted p-ring.

## **2.2 WIRING:**

- A. Pathway Requirements:
  - 1. Prior to placing any cable pathways or cable, the contractor shall survey the site to determine job conditions will not impose any obstructions that would interfere with the safe and satisfactory placement of the cables.
  - 2. All pathways shall be designed, constructed, grounded, and installed in accordance with all recommendations delineated within TIA 569-B and Standard TIA 942-B.
  - 3. If applicable, provide plenum rated cable/connectors where required, cabling/connectors must be appropriate for the environment that it is installed in.
  - 4. Provide moisture rated cable for all wet locations, including any conduit in or below slab on grade.

B. Conduits:

1. Achieve the best direct route parallel with building lines with no single bend greater than 90 degrees or an aggregate of bends in excess of 180 degrees between pull points or pull boxes.
2. Provide large radius elbows on all bends.
3. Conduit runs shall not have continuous sections longer than 100 feet without a pull box. Refer to rough-in schedule for conduit fill capacity.
4. Conduits should not be routed over or adjacent to heat sources such as boilers, hot water lines, or steam lines. Neither should they be routed near large motors, generators, photocopy equipment, or electrical power cabling and transformers.
5. After installation, conduits shall be clean, dry, unobstructed, capped for protection, labeled for identification, reamed, and fitted with bushings.
6. A 200lb pull cord (nylon, 1/8" minimum) shall be installed in any empty conduit.
7. All cabling shall be installed in a minimum of 3/4" conduit to accessible ceiling space unless otherwise noted. Provide conduit to accessible ceiling space and then utilize non-continuous open top cable supports every 3' to 5'.

C. Cabling System:

1. Follow T568B scheme for network copper category cabling terminations.
2. In a false ceiling environment, a minimum of 3 inches shall be maintained between cable supports and false ceiling. At no point shall cable(s) rest on lay-in ceiling grids or panels.
3. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
4. Cables shall not be attached to ceiling grid seismic support wires or lighting fixture seismic support wires. Where support for cable is required, the contractor shall install appropriate carriers to support the cabling. No exposed cabling is allowed.
5. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to the school district.
6. Cable shall not be draped on, tied, or otherwise secured to electrical conduit, plumbing, ventilation ductwork or any other equipment. Cable shall be secured to building supports or hangers or to additional blocks or anchors specifically installed for this purpose.

D. Access Control Cabling:

1. Provide the following cable from the ACS head-end panel(s) to the junction box located above each door that has access control door hardware equipment installed:
  - a. Access Control Composite Cable:  
OSDP Access Control Composite Cable: *Windy City Wire, UL Listed, CMP #4461030-OSDP.*
2. The access control composite cable outer jacketing color shall be **Yellow**.
3. Provide the following cable from the junction box above each door that has ACS door hardware equipment, to each device:

(CR) Card Reader 22/1P OAS Lo-Cap, RS-485, 120 Ohms + 18-02 Twisted Non-Shielded, Jacketed (OSDP)

(REX) Request for Exit Motion: 4/C, 22 AWG UL Listed, Stranded, CMP cable.

(ES, ECB, EL, MAG) Door Locking Hardware 4/C, 18 AWG UL Listed, Stranded, CMP cable.

(DPS) Door Position Switch 2/C, 22 AWG UL Listed, Stranded, CMP cable.

4. Provide the following cable from the ACS head-end panel(s) to these devices:

Main Lockdown Credential Card Reader: 22/1P OAS Lo-Cap, RS-485, 120 Ohms + 18-02 Twisted Non-Shielded, Jacketed (OSDP)

Panic / Duress Button: 4/C, 18 AWG, UL Listed, Stranded, CMP cable.

Momentary Door Release Button: 4/C, 18 AWG, UL Listed, Stranded, CMP cable.

(PTE) Push to Exit Button: 4/C, 18 AWG, UL Listed, Stranded, CMP cable.

5. ADA Door Opener/Actuator: Provide connection to door opener/actuator to access control system. Program credential card reader and ADA operator per IBC requirements. All ADA devices shall be wired. No wireless equipment allowed.

6. Wiring by Divisions 26: The electrical connections/terminations for certain equipment provided under door hardware divisions has not been specifically indicated on the electrical drawings and must be provided by and field coordinated by the door hardware trade requiring such electrical connections. Electrical contractors shall review architectural drawing, door hardware specifications and coordinate with said contractors to confirm electrical needs.

### **2.3 ACCESS CONTROL SYSTEM CONFIGURATION AND PROGRAMMING:**

- A. Configure and program the access control system to meet both the manufacturer's specifications, instruction, and the school district's requirements, ensuring a complete and fully functional system. Involve the school district as much as possible to align with their intended operation of the system and facilitate a smooth transfer of operations upon the project's completion.
- B. Provide a fully commissioned system to the school district and ensure the entire system is operating as intended and in accordance with school district policy.
- C. Label all cables on both ends in all boxes, panels, and racks according to school district standards.
- D. The contractor shall include in the base contract all costs required to program lockdown procedures based upon the requirements and direction of the school district.
- E. The contractor shall include necessary programming for fire-alarm panel tie-in and door release based upon the requirements and direction of the school district and/or AHJ.
- F. Contractor shall input database of all required card holders and desired schedules for users and/or groups. It is the contractor's responsibility to coordinate with the school district on which card holders have access to which openings.

### **2.4 CYBER SECURITY:**

- A. Contractor shall change all default usernames and passwords for all network devices provided. A strong password should -
  - 1. Be at least 8 characters in length
  - 2. Contain both upper and lowercase alphabetic characters (e.g., A-Z, a-z)

3. Have at least one numerical character (e.g., 0-9)
  4. Have at least one special character (e.g., ~!@#\$\$%^&\*()\_-=)
- B. No written username or passwords shall be located in any areas of the installation.
  - C. Network devices to be set up on a separate network other than school district LAN ensuring no internal or external users can access system without authorization.
  - D. Follow manufacturers hardening guide and use best industry practices to secure network and devices provided by contractor and associated with system.
  - E. No equipment in this specification shall contain Huawei / HiSilicon chips or any other equipment deemed a cyber security risk on the school district network.
  - F. All credential card readers and head-end control panels communication shall use the latest version of Open Supervised Device Protocol (OSDP).

### **3.7 OPERATING AND MAINTENANCE MANUALS:**

- A. Operating and maintenance manuals shall be submitted prior to testing of system. A total of two manuals shall be delivered to the school district. Manuals shall include all model numbers, service, installation, and programming information. All information must be bookmarked with a table of contents.
- B. Include all the following information:
  1. Warranty
  2. Network settings (IP & MAC Addresses)
  3. Username and passwords
  4. Riser diagrams from Shop drawings
  5. Training videos
  6. USB Flash drive with programing source code and software editing programs
  7. Installers and manufacturer contact information

### **3.8 RECORD DRAWINGS:**

- A. The school district shall provide electronic (DWG) format of the access control system drawings that as-built construction information can be added to. These documents will be modified by the security contractor to denote as-built information as defined above and returned to the school district
- B. A complete set of CAD as-builts are expected to be maintained during project installation (progress-set) and submitted upon final completion. These as-builts shall show wire paths, final device location, color coding, specific interconnections between all equipment, and internal wiring of the equipment and any changes to the configuration of the original construction drawings. No handwritten as-built documentation is allowed. Provide a complete set of "as built" drawings in paper and electronic (DWG and PDF) to the school district.

### **3.9 TRAINING:**

- A. The access control system shall be complete and have been finalized by the school district and engineer prior to any training.
- B. Provide a minimum of two sessions that each consist of two hours of training on the operation and installation of the access control system on the job site. Ensure the school

district designated personnel are proficient in the control and operations of the access control system.

- C. Contractor to verify that their contact information readily available.
- D. Contractor shall provide a three-month follow-up and two-hour training on advanced features of the system.
- E. Contractor to provide the training information within their bid submittal.

**END OF SECTION 28 2205**

## SECTION 28 2300

### VIDEO SURVEILLANCE SYSTEM

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26, 27 & 28 basic materials and methods sections apply to work specified in this section.
- C. Division 7 firestopping applies to the work of this section.
- D. Refer to specification 26 0553 for cabling, conduit, and junction box color requirements.
- E. Refer to specification 27 1500 for category and/or optical fiber cable and connectivity specifications.
- F. All unshielded category 'UTP' and/or optical fiber cable for security equipment used on this project shall match the horizontal cabling within the building.
- G. Definitions:
  - 1. VMS: Video Management System
  - 2. NVR: Network Video Recorder
  - 3. IP: Internet Protocol
  - 4. PTZ: Pan Tilt Zoom
  - 5. PoE: Power Over Ethernet
  - 6. LPR: License Plate Recognition
  - 7. IR: Infrared
  - 8. WDR: Wide Dynamic Range
  - 9. IP Rating: Weather/Environment Rating
  - 10. IK Rating: Vandal Resistant Rating
  - 11. AD: Active Directory
  - 12. UPS: Uninterruptible Power Supply

##### 1.2 ADMINISTRATIVE REQUIREMENTS:

- A. BNA Project Contact(s):
  - 1. Drayton Bailey  
Phone: 801-532-2196  
Email: Drayton@BNAConsulting.com
  - 2. Dan Varney  
Phone: 801-532-2196  
Email: DVarney@BNAConsulting.com

### **1.3 DESCRIPTION OF WORK:**

- A. All active surveillance equipment including cameras and camera mounting hardware is going to be furnished by the school district, and the security contractor is to install this equipment. The security contractor is to also paint the mounting hardware and cameras to match the building mounting surface color. Contractor to coordinate colors with the school district and the architect prior to prep and painting. And the school district will be doing all of the cameras and systems programming.
- B. Contractor shall provide all labor, materials, tools, paint, and equipment required for the complete installation of work called for in the construction documents.
- C. Contractor is responsible for coordinating & verifying with other trades, and the owner, for equipment locations, mounting requirements, supports, painting the camera housings and mounting brackets to match the building mounting surface color, and plenum space requirements.
- D. Refer to other Division-26 sections for requirements for raceways, trays, boxes, and fittings, and supporting devices, and other sections, as applicable.
- E. Division 27 1500 shall provide installation and execution requirements for all category and/or optical fiber cabling and connectivity required within the IP video surveillance system. Cabling from camera to patch panel shall be provided by section 27 1500 contractor to allow for single cable installer and single warranty to structured cabling system.
- F. Division 27 1500 Contractor shall provide complete cable and outlet system as indicated on the drawings and described herein. Work shall include all associated infrastructure transmission components and support appliances including, but not be limited to cable, jacks, terminal blocks, racks, cabinets, wire management, labeling, patch cords, and all terminations as specified herein.
- G. Division 27 1500 shall provide installation and execution requirements for all category and/or optical fiber cabling and connectivity required within the IP video surveillance system. Cabling from camera to patch panel shall be provided by section 27 1500 contractor to allow for single cable installer and single warranty to structured cabling system. Coordinate all work with section 27 1500 contractor.
- H. The work of this section includes electrical raceways (minimum 3/4"), boxes and fittings, as specified in applicable Division 26 & 27 Basic Materials and Methods sections, which are used to enclose the network Cat 6A cable. Utilize cable tray where possible.

### **1.4 BID SUBMITTAL:**

- A. Provide a detailed scope of work document for all services provided.
- B. Submittals shall be submitted in a digital format with bookmarks for each section of equipment. Any submittals that are partial or incomplete shall be rejected and count as one submittal against the submittal allowance. No hand-written documentation is allowed.
- C. Provide a complete list of materials for all components, accessories, and hardware to be provided in order to assemble a complete and working system as described within the contract documents.
- D. Provide a breakout cost of material and labor as different line items. Bids must include line-item pricing for major parts and components of the system.
- E. Submit manufacturer's data sheets and installation details for all devices, panels, cables, and head-end equipment. Product data showing multiple options, products and/or models shall be clearly marked identifying the specific options, products and/or models being provided.



- F. Submit manufacturer certifications for all systems provided. Certifications must be from local office providing the install.
- G. All change orders will be required to have the same discounts on equipment than original bid. And follow the above information for all change orders.

**1.5 COORDINATION:**

- A. Coordinate final inspection of the systems installed, with owner, three weeks in advance.
- B. Obtain GANTT chart for construction time frame from the General Contractor.
- C. Coordinate with owner and electrical contractor PRIOR to rough-in to coordinate exact location of end devices.
- D. Meet with electrical contractor prior to pathway rough-in to coordinate system requirements in each area.
- E. Coordinate meeting with owner's IT Department prior to ordering equipment to verify IT requirements and standards.
- F. Coordinate color and finish of all camera components with architect or electrical contractor as appropriate.
- G. Notify engineer of any modifications between contract documents and submittals. It is the contractor's responsibility to ensure compliance with the documents.
- H. Coordinate & verify with the electrical contractor on all interfaces, and equipment devices that they will need to provide 120VAC power to.

**1.6 QUALITY ASSURANCE:**

- A. Manufacturers: Firms regularly engaged in manufacturing of security system equipment and components of the types described here-in and whose products have been in satisfactory use in similar applications for not less than five years.
- B. Bidders wishing to provide equipment other than the equipment specified shall submit proposed substitute equipment to Project Leader eight working days prior to bidding. Submittals for prior approval shall include description of equipment, design intent, complete riser diagrams for proposed equipment, equipment specifications, cut sheets of proposed equipment, reason for alternate equipment. Project Leader may request physical equipment to test and demo. Acceptance of proposed equipment by owner shall not relieve security contractor from responsibility to provide systems equal to those specified in this Section. Contractor shall be ultimately responsible for providing complete and working system that function, control, and operate in the same manner as the specified equipment. Owner has final say if proposed equipment is equal to the specified equipment. Equipment that owner is not familiar with will require the contractor to provide manufacturer training at manufacturer's facility and have a manufacturer representative present at time of commissioning.
- C. INSTALLATION CONTRACTORS:
  - 1. Integrating firm shall have worked satisfactorily for a minimum of five years of completing systems equal to this scope, quality, type, and complexity.
  - 2. Key personnel assigned to the project shall each have minimum of five years of experience in completing systems equal to this scope, quality, type, and complexity.
  - 3. Contractor shall be a factory authorized installer of all equipment specified for the geographical area of the project.

4. Contractor shall maintain complete installation and service facilities for the duration of the project contract.
  5. Contractor shall have current manufacturer certifications for all security systems and equipment listed within this specification. Certifications must be from local office providing the install.
  6. All work shall be done by expert technicians qualified in the field with knowledge of specified systems. Workmanship shall comply with industry best practices concerning grounding, shielding, cable dressing, cable termination and equipment mounting.
  7. All technicians are required to have proper state licensing to perform work within this specification.
- D. Pre-Approved Installation Contractor(s):
1. *Open to all State Licensed & Manufacture Certified Contractors*
- E. Bidders not pre-approved: Bidders that are not on this pre-approved list shall submit in writing the following for review at least (8) working days prior to bid.
- List of qualifications include:
1. Industry and manufacturers certifications.
  2. Past and current projects within the last 5 years similar in scope and size.
  3. (3) Different referrals from the owners of (3) different projects within the last 5 years.

## 1.7 SUBMITTALS:

- A. Refer to specification 26 0502 for shop drawing submittal requirements.

## PART 2 – PRODUCTS

### 2.1 GENERAL REQUIREMENTS:

- A. All of the active IP Video Surveillance equipment (i.e., NVR, VMS, IP surveillance cameras and mounts, IP camera licenses, PoE, power injectors, power supplies, network switches, protective enclosures, converters, etc.) will be provided by the school district, and installed and painted by the contractor, and set-up and programmed by the school district.
- B. Prior to starting any work, coordinate a meeting and confirm with School District all equipment locations, and cable pathways.
- C. DIV 27 1500 contractor to provide cable that is rated for the environment that it is installed in (i.e., plenum, underground conduit, direct burial, conduit in slab on grade, etc.) All cabling installed in wet locations shall be listed for use in wet locations.
- D. The CAT6 Network cable jacketing color for the IP Cameras shall be purple.
- E. Indoor Surveillance IP Cameras:
  1. Electrical Contractor: Prior to starting any work contractor will coordinate a meeting with school district and verify each surveillance camera location, and mounting requirements. Provide each camera location with the school districts and manufacture's suggested backbox and one 1" conduit installed into accessible ceiling space. In areas where there is drop ceilings, only stub conduit into those areas.
  2. DIV. 27 1500 Contractor: Provided one CAT6 cable to each surveillance camera location. On the camera end of the CAT6 cable terminate an RJ45 modular

connector to it. In areas where there is a drop ceiling, coil up 5' of cable at the camera location and put cable above the drop ceiling. Install category cabling to the closest EF/ER/TR room. Provide industry standard service loops on each end of the category cable. Route category cabling over to the designated equipment rack, to the assigned patch panel, terminate, and test.

F. Outdoor Surveillance IP Cameras:

1. **Electrical Contractor:** Prior to starting any work contractor will coordinate a meeting with school district and verify each surveillance camera location, and mounting requirements. Provide each camera location with the school districts and manufacture's suggested backbox and one 1" conduit installed into accessible ceiling space.
2. **The DIV 27 1500 Contractor:** Provided one CAT6 cable to each surveillance camera location. On the camera end of the CAT6 cable terminate an RJ45 modular connector to it. The CAT6 network cable will be installed to the closest EF/ER/TR room. Provide industry standard service loops on each end of the category cable. Route category cabling over to the designated equipment rack, to the assigned patch panel, terminate, and test.

G. Outdoor Surveillance IP Cameras mounting on Parking Lot Light Poles:

1. **Electrical Contractor:** Provide from the closest EF/ER/TR room two 1-1/4" SCH 40 pvc conduits to in-ground secure concrete junction box by the pole. And two 1-1/4" SCH 40 pvc conduits from the concrete junction box through the base of the light pole and stubbed up inside of the pole 6". Provide all conduits with nylon pulling twine.
2. **Electrical Contractor:** Provide from the nema rated enclosure, through designated 1-1/4" SCH 40 conduit that home runs to nearest EF/ER/TR room, provide the correct electrical wiring for 120VAC, and provide one dual outlet in nema enclosure.
3. **DIV 27 1500 Contractor:** Provide one outdoor rated 6 strand single mode fiber (OS2) from nema rated enclosure, through designated 1-1/4" SCH 40 conduit that home runs to nearest EF/ER/TR room, with industry standard service loops on each end, terminated with LC connectors on each end, and tested.
4. **DIV 27 1500 Contractor:** Provide LT non-metal conduit and connectors from nema enclosure up surveillane IP camera mounting location, and provide one outdoor rated CAT6 cable through the conduit, terminate RJ45 connectors on each end, with industry standard service loops on each end, and test.
5. **School District Provided, Contractor Installed:**
  - a. All of the active IP Video Surveillance equipment (i.e., NVR, VMS, IP surveillance cameras and mounts, IP camera licenses, PoE, power injectors, power supplies, network switches, protective enclosures, converters, etc.) will be provided by the Ogden school district, and installed and painted by the contractor, and set-up and programmed by the school district.
  - b. Hoffman / Pentair stainless steel nema enclosure with hinged locking cover (#A24H1608SSLP, 24"Hx16"Wx8"D) towards the base of the pole mounted 3-4' A.F.G.
  - c. One fiber to copper/data converter.
  - d. One PoE power injector.

H. All terminations of hardware & connectors shall meet the manufacture required cabling specifications.

- I. Verify with School District what labeling scheme they want to use for labeling the network cables.
- J. Provide complete raceway, outlet boxes and miscellaneous items. All conduit utilized shall be EMT grade.
- K. Provide a 5" x 2.875" (or 4-11/16" x 3.25" square) deep square outlet box at each outlet location with single gang plaster or tile ring. Provide wall board adapters / accessories as necessary.

### **PART 3 – EXECUTION**

#### **3.1 INSTALLATION OF SECURITY RACEWAY SYSTEM:**

- A. All installation requirements shall adhere to the requirements of division 27 1500.
- B. Install raceway system and category cabling as indicated, per the expectation of the owner, and to comply with NEC and recognized industry practices. Run a minimum of 1" conduit and specification grade category cable from each IP camera to accessible ceiling space, then utilize non-continuous cable support devices to cable tray then to nearest tray EF/ER/TR/TE.
- C. Contractor shall apply & utilize all RCDD Standards & Code Compliances to ensure all industries standards and customer requirements are met.

**3.2 GROUNDING:** Refer to Division 27 1500.

**3.3 WIRING:** Refer to Division 27 1500

**3.4 LABELING:** Refer to Division 27 1500.

**3.5 TESTING:** Refer to Division 27 1500.

**3.6 WARRANTY:** Provide warranty complying with Division 26 0500 & Division 27 1500.

**END OF SECTION 28 2300**

## SECTION 28 3111

### FIRE ALARM AND DETECTION SYSTEM

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26 Basic Materials and Methods sections apply to work specified in this section.

##### 1.2 DESCRIPTION OF WORK:

- A. Provide a new addressable fire alarm and detection system.
  - 1. Locate FACP Panel within the ER/MDF.
  - 2. Provide and install NAC/booster panels as needed throughout the project.
- B. Provide all fire alarm devices.
- C. Provide duct smoke detectors and fan relays at all fan units 2000 CFM and over. Shut down all supply and return fans upon a general alarm signal.
- D. Provide CO detectors, Monitor Module and fan relays at all gas fired fan units. Shut down all supply and return fans upon a general alarm signal.
- E. Provide a fire alarm duct detector within 5-feet of any fire/smoke damper as required to comply with IMC 607.5.4.1. The duct detector shall be listed for the air velocity, temperature and humidity at the point where it is to be installed. A duct detector will not be required at a fire/smoke damper located on a corridor wall where the corridor has smoke detection devices installed. For dampers installed within an un-ducted opening in a wall, a spot-type detector listed for releasing service shall be installed within 5-feet horizontally of the damper. Provide a fire alarm relay at each fire/smoke damper. Provide a test switch at each location where the damper is located above an inaccessible ceiling or is located more than 10 feet above the finished floor. Coordinate the location of test switches with owner/architect.
- F. All initiating devices connected to the fire alarm control panel shall be analog addressable.
- G. All wiring shall be in conduit (3/4" minimum). All conduit and connectors, shall be made of steel. All conduit runs shall form a complete loop from the fire alarm control panel.
- H. Provide vandal resistant cages to protect horn/strobes, smoke and heat detectors as indicated on drawings and, in gyms whether shown or not. Securely fasten security cages as required. Provide backing and bracing as required to ensure that attachment extends beyond the ceiling materials. Cages shall have two pieces, one backplate and one cover to attach to backplate. Provide cages/guards on horn/strobes that are clear and do not limit their effect on the field performance with the listing requirements.
- I. Comply with NEC as applicable to construction and installation of fire alarm and detection system components and accessories. Provide components and systems, which are UL-listed and labeled for fire alarm. Provide fire alarm and detection systems and accessories, which are FM approved. Comply with State and local requirements as applicable. Provide wiring of horn/strobe units such that the horn section and the strobe

section are controlled separately. Provide the ability to silence the horns and maintain the operation of the strobes.

- J. The project shall be UL Certificated. Upon completion of the project, provide to the owner, a certificate from the UL Listed supplier with the project specific certificate. Certificate and number shall be documented and included as part of the closeout documentation.
- K. Ensure that the fire alarm supplier has a minimum of (1) NICET Level IV, and (3) NICET Level III technicians on staff.
- L. **Carefully review all Division 23 drawings for all fire/smoke and smoke dampers. Fire/smoke and smoke dampers are NOT shown on electrical plans. Electrical contractor is responsible for coordinating 120V power to all dampers and providing fire alarm connections to each one. See mechanical drawings for all locations.**
- M. Provide a fire alarm duct detector within 5-feet of any fire/smoke damper as required to comply with IMC 607.5.4.1. The duct detector shall be listed for the air velocity, temperature and humidity at the point where it is to be installed. A duct detector will not be required at a fire/smoke damper located on a corridor wall where the corridor has smoke detection devices installed. For dampers installed within an un-ducted opening in a wall, a spot-type detector listed for releasing service shall be installed within 5-feet horizontally of the damper. Provide a fire alarm relay at each fire/smoke damper. Provide a test switch at each location where the damper is located above an inaccessible ceiling or is located more than 10 feet above the finished floor. Coordinate the location of test switches with owner/architect.
- N. Comply with applicable provisions of current NFPA Standard 72 National Fire Alarm and Signaling Code (as applicable), local building codes, the most current adopted revision of the International Building Code (IBC), the International Fire Code (IFC), the International Mechanical Code (IMC), and meet requirements of local authorities having jurisdiction.

### 1.3 QUALITY ASSURANCE:

- A. Installer:
  - 1. Fire alarm installers shall have the highest manufacturer's certifications as follows:
    - a. Honeywell - Silent Knight
  - 2. Integrating firm shall have worked satisfactorily for a minimum of (5) years of completing systems equal to this scope, quality, type and complexity.
  - 3. Key personnel assigned to the project shall each have minimum of (10) years of experience in completing systems equal to this scope, quality, type and complexity.
  - 4. Contractor shall be a factory authorized distributor of all equipment specified for the geographical area of the project.
  - 5. Contractor shall maintain complete installation and service facilities for the duration of the project contract.
  - 6. Contractor shall have current manufacturer certificates for all fire alarms systems and equipment listed within this specification.
  - 7. Contractor shall be in good standing with owner based on previous projects.
  - 8. Contractors that do not meet the above requirements cannot bid on this project.

- B. All work shall be done by expert technicians qualified in the field with knowledge of specified systems. Workmanship shall comply with industry best practices concerning grounding, shielding, cable dressing, cable termination and equipment mounting.
- C. PRE-APPROVED INSTALLERS:
  - 1. AAA Fire
  - 2. StateFire Sales & Service
    - a. Kyle A. Arigot - Regional Sales Manager; [karigot@statefire.com](mailto:karigot@statefire.com)
    - b. Cell: 801-707-0796, Office: 801-288-2100
  - 3. Wasatch Electric
    - a. Brandon Carlile, (801) 487-4511, [bcarlile@wasatchelectric.com](mailto:bcarlile@wasatchelectric.com)  
2455 W 1500 South, STE A, Salt Lake City, UT 84104
  - 4. Bids submitted by non-approved installers will not be accepted.
  - 5. Bidders not pre-approved shall submit in writing the following for review at least (8) working days prior to bid:
    - a. List of qualifications including:
      - i. Industries certifications including manufacturers.
      - ii. Approved resale manufacturers.
    - b. Past and current projects within the last 5 years similar in scope and size.
    - c. (3) Different referrals from the owners of (3) different projects within the last 5 years.

#### 1.4 SUBMITTALS:

- A. Refer to Section 26 0502 for electrical submittal requirements.

### PART 2 - PRODUCTS

#### 2.1 ACCEPTABLE MANUFACTURERS:

- A. MANUFACTURER: Subject to compliance with requirements, provide fire alarm and detection systems of one of the following:
  - 1. Honeywell - Silent Knight
- B. The job foreman or lead technician shall be factory trained and certified on the system being installed. Individual shall have a minimum NICET II certification.

#### 2.2 FIRE ALARM AND DETECTION SYSTEMS:

- A. GENERAL: Provide an electrically operated, electrically supervised fire alarm system as described herein. Include control units, power supplies, alarm initiating and indicating devices, conduit, wire, fittings and accessories required to provide a complete operating system. Enclose entire system in raceway. Provide basic wiring materials which comply with Division 26, Basic Materials and Methods Sections for raceways, conductors, boxes, fittings, supports, etc. Minimum wire size to be #14 AWG copper.
- B. SYSTEM TYPE: Analog addressable, non-coded. Either manual activation of a fire alarm station or activation of an automatic initiating device energizes all fire alarm

signaling devices, sounding a non-coded alarm and providing device identification on an annunciator panel.

- C. **SYSTEM OPERATION:** Provide system such that any manual station or automatic initiating device annunciates all alarm indicating units (bells, horns, buzzers, chimes, visual alarm lamps, etc.) continuously until the manual station or initiating device is restored to normal and the fire alarm control unit reset. Annunciate alarm signals by device at the control panel and all remote annunciators. Provide all conductors, raceway, equipment and labor to accomplish the following:
- D. For fans which are not part of the smoke evacuation system, deactivate air supply and return fan units simultaneously by means of a supervised master fan shutdown relay with slave relays as required. Restart air units automatically after panel has been reset. Provide a bypass switch for master fan shut down relay for drill purposes, and indicate by a locked-in lamp that the circuit has been bypassed.
- E. Selectively activate and/or deactivate fan units as required.
- F. Release all magnetic door holders upon activation of an alarm from any device by use of a master relay in the control panel.
- G. Provide supervised circuits for the following:
  - 1. Close dampers upon activation of an alarm from any device through the HVAC interface relays at the Fire Command Center.
  - 2. Recall elevators, upon activation of an alarm, to the floor of building egress unless the alarm is on the egress floor, in which case recall elevator to the level designated by the Fire Marshall. Cooperate with the elevator supplier to ensure complete operable system. Provide shunt trip breaker(s) as required.
- H. Central Station Monitoring. Provide a UL listed fire control communicator in accordance with NFPA 71 with a minimum of two reporting zones to the central station. Provide a communicator with dual phone lines for central station reporting by using Contact I.D. format. Provide integral trouble annunciator. Provide with compatibility for automatic test reports every 24 hours. Provide system and components which comply with UL 2635 and UL 864.
- I. Provide fire alarm control panel with capability of shutting down individual initiating devices for maintenance purposes without affecting the continued operation of other initiating devices.
- J. Provide manual fire alarm stations in boiler rooms, and main administrative office. Provide external alarm horns sufficient to be heard in all parking areas.
- K. Sprinkler Supervision. Provide a signal initiating and supervisory circuit to each PIV (post indicator) valve, and to each sprinkler riser and subdivision. Provide continuous alarm signal upon actuation of any water flow signal initiating device. Sound alarm until the condition has been corrected and the panel manually reset as required by UL864. Provide separate alarm zones for: (1) alarm zones from "waterflow alarms", (2) alarm zones from "supervisory alarm" indicating sprinkler system trouble. Provide power to all alarm bells furnished under Division 23. Review final fire sprinkler drawings and coordinate for panel, flow and tamper switch locations.



- L. Provide relays, monitor modules and connections as required at control panel of kitchen hood suppression system for initiation of alarm signal to fire alarm control panel. Connect hood suppression control panel to shunt trip breakers as required.
- M. Provide all required wiring from gas shut off valve to the hood suppression control panel. Make all connections to insure a properly operating system. Verify with Mechanical Contractor.

**2.3 FIRE ALARM CONTROL PANEL (IntelliKnight® Model5820XL):**

- A. The fire alarm control panel shall be microprocessor-based. Each loop shall be capable of 99 analog addresses and 98 monitor and/or control addresses.
- B. If the microprocessor fails, the system shall execute a default signaling program. This program will enable the panel to sound the audible signals and summon the Fire Department. In addition, a red LED shall light to indicate the device wherein the alarm originated. Inability of the system to sound signals or summon the fire department during microprocessor failure shall not be acceptable.
- C. The fire alarm control panel shall permit the user to perform all necessary functions including but not limited to the following:
  - 1. Alarm/Trouble Acknowledge.
  - 2. Alarm Silence
  - 3. Reset
  - 4. Lamp Test
  - 5. Control of Initiating Devices (on/off)
  - 6. Control of output modules (on/off)
  - 7. Change sensitivity of devices
  - 8. Change time
  - 9. Walk test
  - 10. Check system on battery voltage and current
- D. The fire alarm control panel shall be capable of alarm verification. The control panel shall indicate which smoke detector is in alarm during the pre-alarm window.
- E. All alarm signals shall be locked in at the panel until the operated device is returned to it's normal condition and the control panel is manually reset.
- F. Provide a supervisory module to initiate the blue strobe provided for CO detection.
- G. Provide a "hazard" indication for CO detector signals.
- H. Alarm or trouble activation of initiating points shall be represented in English on the alphanumeric display on both the remote operating panel and the fire alarm control panel indicating the address of the specific device, i.e. Device L4S76, Smoke Detector, 1st floor Rm. 17.
- I. Each initiating and signal circuit shall be electrically supervised for opens, shorts, and ground faults in the wiring.
- J. The occurrence of any fault shall activate the system trouble circuitry but shall not interfere with the proper operation of any circuit that does not have a fault condition.

- K. The system communication loops shall be wired using Class "A" (Style 6) supervised circuits (a ground fault on either conductor or a break shall not prevent a device from operating on either side of the break)
- L. The fire alarm control panel shall contain circuitry permitting the transmission of trouble and alarm signals over leased phone lines by the means of reverse polarity. There shall be a supervised disconnect switch to allow testing of the fire alarm control panel without transmitting an alarm to the central station.
- M. The fire alarm control panel shall include the following features.
  - 1. Auxiliary SPDT alarm actuated contacts.
  - 2. Auxiliary SPDT trouble actuated contacts.
  - 3. A solid-state power transfer circuit that shall switch to standby power automatically and instantaneously if normal power fails or falls below 15% of normal ("brown out" conditions). This electronic circuit shall allow the batteries to be effectively "floated" on the operating system to avoid upsetting the normal microprocessor scan and minimize resultant nuisance troubles and/or alarms.
  - 4. A ground fault detector to detect positive or negative grounds on the initiating circuits, signal circuits, power circuits, and telephone line circuit. A ground fault code on the alphanumeric display shall provide indication of either a positive or negative ground fault and shall operate a general trouble but shall not cause an alarm to be sounded.
  - 5. A short circuit error message shall be a standard feature of the fire alarm control panel. Each communication loop shall be monitored and shall have a distinctive error message.
  - 6. Lightning protection shall be a standard feature of the fire alarm control panel and shall be incorporated in the power supply circuit, common control circuits, signal circuits, and telephone line circuit.
  - 7. Individual circuit breakers shall be provided for the following: smoke detector power, main power supply, signal circuit #1, signal circuit #2, battery standby power, and auxiliary output.
  - 8. The fire alarm control panel shall be of dead-front construction. One key shall allow access to all electronics or to the dead-front access to the operator functions.
  - 9. Opening the main door shall expose all components for inspection or adjustment without further dismantling of the cabinet, control unit, or wiring.
  - 10. It shall be possible to check and adjust the sensitivity of all analog devices from the main fire alarm panel.
- N. The fire alarm control panel shall have batteries capable of powering the system for (24) hours in standby condition and (5) minutes in alarm.
- O. There shall be no special tools required for the programming of devices. A standard slot head screwdriver only.

## **2.4 REMOTE OPERATING PANEL:**

- A. Remote Operating Panel (Provide color as selected by Architect)
- B. The Remote Operating Panel shall contain alphanumeric display providing status of all devices including the fire alarm control panel.
- C. The Remote Operating Panel shall permit the user to perform all necessary functions including but not limited to the following:
  - 1. Alarm/Trouble Acknowledge
  - 2. Alarm Silence
  - 3. Reset
  - 4. Lamp Test
  - 5. Control of Initiating Devices (on/off)
  - 6. Control of Output Modules (on/off)
  - 7. Change sensitivity of devices
  - 8. Change time
  - 9. Walk test
  - 10. Check System on battery voltage and current

## **2.5 MONITOR MODULE:**

- A. Remote identification module devices shall be attached to any single normally open initiating device (heat detector, waterflow switch, duct detectors, sprinkler, tamper switches, kitchen hood, pull station, etc.). The modules shall supply addressing and status information to the Fire Alarm Control Panel through the dual loop module.

## **2.6 CONTROL POINT MODULE:**

- A. The control point module shall be connected to the same loop as the initiating devices, and shall provide a relay output (Form "C" 2 Amp @ 24 VDC, resistive only).
- B. This relay output shall be used to perform auxiliary functions.
- C. When the AOM is activated, the red "ACTIVE" LED shall be on solid. Under normal conditions, the red "ON LINE" LED shall flash.

## **2.7 DOOR HOLDER:**

- A. Door Holders and Keyed Switch Supplied by door hardware installer and installed by division 26. Provide 24VDC power and control from fire alarm control panel. Include 120V power and 24VDC transformers as required.

## **2.8 MANUAL FIRE ALARM STATION:**

- A. Provide red enclosure, manual fire alarm stations with the following features:
  - 1. Die-cast construction, for semi-flush mounting.
  - 2. Addressable alarm type electrically compatible with system requirements.
  - 3. Double Action
  - 4. Break glass design requiring unit to be opened for resetting, and requiring resetting before closing. Provide one spare "glass" for each manual station. Key reset, keyed like fire control panel.

## **2.9 IONIZATION SMOKE DETECTORS:**

- A. All ionization smoke detectors shall be capable of being replaced without disconnecting any wires or wire connectors from the base of the detector. Each detector shall be installed on a separate base. The detector base shall be capable of receiving a photoelectric, ionization, or electronic thermal detector. All ionization fire detectors shall be UL 268 listed. All detectors shall have (2) viewable LEDs to indicate the status of the device.

## **2.10 DUCT FIRE DETECTORS:**

- A. Provide ionization type with UL 268A listings. Each detector shall be equipped with a remote light. Each detector shall have (2) form "c" alarm contacts rated at 10 amps (at 120VAC).

## **2.11 THERMAL DETECTORS:**

- A. Thermal detectors shall operate on the Rate-of-Rise principal. The detectors shall have a fixed temperature rating of 135 degrees Fahrenheit. Exception: in Boiler rooms, provide temperature rating of 200 degrees Fahrenheit.
  - 1. The heat detector shall consist of a base and a head.
  - 2. The base shall be capable of accepting either a smoke detector or a 135 (or 200) degree heat detector.
  - 3. The head shall automatically restore to its normal standby condition when the temperature returns to its normal range.

## **2.12 AUDIOVISUAL ALARM HORNS:**

- A. Provide audio-visual alarm horns with selectable multi-candela strobes (15/30/75/110 cd) and selectable horn ( 90 or 95 dba). Provide outdoor devices listed for exterior use. Provide white devices inside and red devices outside, or as instructed by the architect.
- B. All strobes shall be synchronized.

## **2.13 CEILING MOUNTED AUDIOVISUAL ALARM HORNS:**

- A. Provide audio-visual alarm horns with selectable multi-candela strobes (15/30/75/110 cd) and selectable horn ( 90 or 95 dba). Provide outdoor devices listed for exterior use. Provide white devices inside and red devices outside, or as instructed by the architect.
- B. All strobes shall be synchronized.

## **2.14 CEILING MOUNTED VISUAL ALARM STROBES:**

- A. Provide visual alarm strobes with selectable multi-candela strobes (15/30/75/110 cd). Provide white devices.
- B. All strobes shall be synchronized.

## **2.15 VISUAL ALARM STROBES:**

- A. Provide visual alarm strobes with selectable multi-candela strobes (15/30/75/110 cd). Provide white devices.

- B. All strobes shall be synchronized.

**2.16 CARBON MONOXIDE (CO) DETECTOR:**

- A. Provide a carbon monoxide detector. Provide detectors with the following features:
  - 1. Compliance with UL2075.
  - 2. Trouble relay.
  - 3. Wiring supervision with SEMS Terminals.
  - 4. A six year end-of-life timer.
  - 5. Sounder base for sound audible alarm.

**2.17 VISUAL ALARM STROBES (BLUE):**

- A. Provide a visual alarm strobe with blue light for CO notification.

**2.18 AUXILIARY RELAY:**

- A. Remote auxiliary relay boards shall be rated at 10 AMPS @ 120 VAC. A red LED shall light to indicate relay activation. All relays shall transfer on general alarm and latch on until reset. All relays shall be supervised. The control output provided can be used in conjunction with fire alarm applications (i.e. fan controls, dampers, doors, and any other general alarm control).

**2.19 HORN AMPLIFIER (As required for higher amp requirements).**

**2.20 WATER FLOW MODULE.**

**2.21 INITIATING MODULES:**

- A. Provide style "6" initiating modules capable of receiving and annunciating an alarm from any detector, even with a single fault condition on any initiating circuit.
- B. Power all smoke detectors from the "Style 6" initiating loop wiring. For systems which power smoke detectors separately from the "Style 6" loop, provide monitoring for both the power source and the independent initiating wiring, so that complete trouble and alarm indication is achieved by loop. Provide capability to operate all smoke detectors, even with a single fault condition on the smoke detector power wiring. Provide one spare initiating circuit.

**2.22 SIGNALING MODULES:**

- A. Provide signaling as required. Provide power adequate to sound all signaling devices concurrently. Provide supervised indicating circuits for polarized 24V D.C. alarm signaling devices. Provide 2 spare signaling circuits.
- B. Each signal circuit shall have a separate disconnect switch for servicing the fire alarm system. Each and every indicating circuit shall have a distinct location description. Power supply shall be at fire alarm control panel. Remote power supplies and indicating circuits will not be acceptable.

**2.23 SUPPLEMENTAL NOTIFICATION CIRCUITS:**

- A. Provide supplementary notification appliance circuit panel(s) as required. The 'PANELS' shall be capable of supplying up to four Class A, Style Z notification appliance circuits. The panel shall contain its own battery charger, regulated power supply, and shall be

supervised for ground fault, overcurrent, open circuits and low battery conditions. Ground fault, battery and circuit trouble conditions shall transmit a trouble signal to the main fire alarm control panel.

## **2.24 SYSTEM CONFIGURATION PROGRAMMING:**

- A. To help the owner in programming, system changes, and servicing, the fire alarm system shall have the following functions:
  - 1. The FACP shall be capable of an auto-configuration, which, via a password, all analog devices and panel modules are automatically programmed into the system. At this point the system will operate as a general alarm system without any other programming.
  - 2. If any two devices are addressed the same, the LED's on both devices will light steady and the panel will read "extra address with the address number".

**2.25** If any device is installed and not programmed into the system, the LED will light steady and the panel will read the same as above.

## **2.26 BATTERIES/POWER SUPPLIES:**

- A. Provide standby batteries capable of operating fire alarm system for minimum of 24 hours, then operating all indicating units for at least five minutes. Locate batteries in fire alarm control unit, or in similar type enclosure located as directed. Provide all interconnecting wiring. Place batteries which vent hydrogen gas in separate enclosure. Provide 30 percent spare capacity.

## **PART 3 - EXECUTION**

### **3.1 GENERAL REQUIREMENTS:**

- A. Install fire alarm and detection systems as indicated, in accordance with equipment manufacturer's written instructions and complying with applicable portions of NEC and NECA's "standard of installation".
- B. Install wiring, raceways, and electrical boxes and fittings in accordance with Division 26 Basic Materials and Methods section, "Raceways", "Wires and Cables", and "Electrical Boxes and Fittings", and in accordance with other sections, as applicable. Label all junction boxes "F.A." and paint box and cover red, per Section 16135.
- C. All wire used on the fire alarm system shall be U.L. Listed as fire alarm protective signaling circuit cable per NEC, Article 760.
- D. If twisted or shielded wire is required or recommended by the manufacturer it must be used.
- E. Review proper installation procedure for each type of device with equipment supplier before installation.
- F. Provide Two (2) network IP addresses at the new fire alarm control unit for connection to the fire alarm system. Coordinate with the district IT department for network connections.

- G. Coordinate the mechanical units that are protected by Carbon Monoxide Detectors and shut down the unit upon detection of CO. Verify exact requirements with the Fire Marshal.
- H. Label the end of wires in all boxes including panel, power supplies, pull boxes, etc.
- I. Label circuit breaker feeding fire alarm panel: "Fire alarm circuit". Use plastic laminate label, white letters on red background.
- J. Where smoke or heat detectors are specified, install device a minimum of three feet from adjacent air supply diffusers to ensure proper operation of device.
- K. Refer to NFPA for spacing and exact placement of fire alarm devices.
- L. Provide one set of approved, stamped, fire alarm system drawings on site throughout construction, and make available for Fire Marshal reference.
- M. Upon completion of the Fire Alarm System Installation, a test of the entire fire alarm and CO monitoring system is required prior to a scheduled inspection in the presence of a representative from the Utah State Fire Marshal's Office. Include a 24-hour secondary power test.
- N. Provide one set of instructions on operation of the Fire Alarm System and one set of the As-Built Drawings in a cabinet, located at or near the Fire Alarm Control Unit (FACU), or Fire Alarm Control Panel (FACP) as approved by the Architect and Fire Marshal. Label the cabinet "SYSTEM RECORD DOCUMENTS".

### **3.2 GUARANTEE:**

- A. Furnish a three-year guarantee for all equipment, materials and installation, including all labor, transportation, and equipment.
- B. Emergency Response. The fire alarm equipment supplier shall provide an emergency response within four hours of any reported system failure to resolve the problem on a continuous basis.

### **3.3 PRE-TEST:**

- A. The contractor shall with a representative of the manufacturer conduct a test 3 days before the final test to verify operation of all devices. Any problems must be corrected before the final test.

### **3.4 FINAL TEST:**

- A. Before the installation shall be considered completed and acceptable, a test on the system shall be performed as follows:
  1. The contractor's job foreman, a representative of the manufacturer, a representative of the owner, shall operate every building fire alarm device to ensure proper operation and correct annunciation at the control panel. Fan shutdown and door holder circuits shall operate.
  2. Conduct a full 24-hour test of battery operation. System shall be put on the batteries for a full 24 hours and all notification appliances shall be operational for a period of 5 minutes.

3. The supervisory circuitry of the initiating and indicating circuits shall also be verified.
4. Provide printout demonstrating successful performance of all devices.

**3.5 LABELING:**

- A. All devices shall be labeled with their appropriate address. The labels shall be 18 point pressure sensitive labels.
- B. All initiating devices shall be programmed to include the device address and a complete user text English location description, i.e. Device L4S76, Smoke Detector, 1st floor Rm.17.
- C. Label the end of all wires in all boxes including panels, power supplies, pull boxes, etc.

**3.6 O & M and RECORD DRAWINGS:** Refer to Section 26 0502 for requirements.

**3.7 TRAINING:**

- A. Provide minimum four (4) hours training on the operation and installation of fire alarm system, at job site, at no cost to owner.
- B. Provide programming training and software to the Owner.

**END OF SECTION 28 3111**



**DIVISION 31 - EARTHWORK**

Section 31 2000

Earth Moving

Section 31 2216

Fine Grading

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## **SECTION 311000**

### **SITE CLEARING**

#### **PART 1 - GENERAL**

##### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

##### **1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Removing existing vegetation as indicated on demolition plan.
  - 2. Clearing and grubbing.
  - 3. Stripping and stockpiling topsoil.
  - 4. Removing above and below-grade site improvements.
  - 5. Disconnecting, capping or sealing, abandoning site utilities in place, and removing site utilities.
  - 6. Temporary erosion and sedimentation control measures.
- B. Related Sections include the following:
  - 1. Division 01 Section "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security, protection facilities, and temporary erosion and sedimentation control procedures.
  - 2. Division 02 Section "Selective Site Demolition" for demolition of buildings, structures, and site improvements.
  - 3. Division 31 Section "Earth Moving" for soil materials, excavating, backfilling, and site grading.

##### **1.3 DEFINITIONS**

- A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other non-soil materials.

##### **1.4 MATERIAL OWNERSHIP**

- A. Except for stripped topsoil or other materials indicated to remain on Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site. Stripped topsoil shall only be removed from the property upon approval from the Owner.

## **1.5 SUBMITTALS**

- A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.
- B. Record drawings, according to Division 01 Section "Project Record Documents," identifying and accurately locating capped utilities and other subsurface structural, electrical, and mechanical conditions.

## **1.6 QUALITY ASSURANCE**

- A. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

## **1.7 PROJECT CONDITIONS**

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  - 2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
  - 1. Do not proceed with work on adjoining property until directed by Architect.
- C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- D. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- E. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

## **PART 2 - PRODUCTS**

### **2.1 SOIL MATERIALS**

- A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 31 Section "Earth Moving."
  - 1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly flag trees and vegetation to remain or to be relocated.
- C. Protect existing site improvements to remain from damage during construction.
  - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

### **3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction, sediment and erosion control Drawings, a sediment and erosion control plan, specific to the site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

### **3.3 UTILITIES**

- A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.
  - 1. Verify that utilities have been disconnected and capped before proceeding with site clearing.
- B. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
  - 1. Arrange with utility companies to shut off indicated utilities.
  - 2. Owner will arrange to shut off indicated utilities when requested by Contractor.
- C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Architect's written permission.
- D. Excavate for and remove underground utilities indicated to be removed.
- E. Removal of underground utilities is included in Division 21, Division 22, Division 26, Division 27, and Division 28 Sections covering site utilities.

### 3.4 CLEARING AND GRUBBING

- A. Remove obstructions such as shrubs, grass, and other vegetation to permit installation of new construction.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
  - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

### 3.5 TOPSOIL STRIPPING

- A. Remove top 1-2" of soil including all weeds, grass, brush and other vegetation and haul this material off-site before stripping topsoil. Actual depth of soil removal from site may vary depending on the amount of roots and plant material in the top 1-6" of soil. The base bid shall be to strip up to 3" of soil, etc. from the site and dispose of it off-site. Consult with Landscape Architect on-site prior to stripping soil so that a visual inspection can be done. Contractor shall review the topsoil report already completed with the Landscape Architect at this meeting. See appendix 'A' for topsoil report.
- B. Strip only from 3" depth to 12" depth (the first 1-3" being disposed off of-site) of topsoil in a manner to prevent intermingling with underlying subsoil or other waste materials. This depth of topsoil stripping may need to be modified based on the results of the topsoil test noted above and also based on observations at the meeting to be held on-site as discussed above. The contractor shall calculate how much soil is needed for the lawn areas and planter areas and then only needs to strip that much soil (less the amendments).
  - 1. Remove subsoil and non-soil materials from topsoil by screening all topsoil from trash, debris, weeds, roots, and other waste materials greater than ½ inch in any dimension.
  - 2. Amount of topsoil that needs to be stockpiled shall be determined by the following:
    - a. Strip all soils under buildings, structures, hardscaped/paved areas per civil, architectural, mechanical and structural drawings.
    - b. Strip enough topsoil based on quantity needed to install 4" depth of amended soil in lawn areas and 12" depth of amended soil in planter areas.
    - c. Topsoil depths in lawn and planter areas may be deeper than noted if at no additional cost to the Owner.
- C. Stockpile stripped topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 1. Limit height of topsoil stockpiles to 6 feet.
  - 2. Do not stockpile topsoil within tree protection zones.
  - 3. Minimize overworking of topsoil so that physical properties of topsoil are retained. Topsoil should be stripped and piled in a location that will not interfere with construction. Topsoil shall not be moved from location to location. Topsoil shall not be driven over with any equipment. Overworking of topsoil may invalidate the reuse of it for landscaping purposes. If topsoil is unusable due to overworking it, moving it, driving over it unnecessarily, etc, contractor shall at his own expense import topsoil to replace damaged topsoil as required. Contractor shall also bear the expense of disposal of any unusable stripped topsoil. Landscape contractor shall provide a second soils test for stockpiled topsoil prior to reuse in landscaped areas. Adjustments may need to be made to amendments depending on results of topsoil test.
  - 4. Dispose of excess topsoil as specified for waste material disposal as directed by the Owner. Owner retains all rights to stripped topsoil. Owner shall approve any removal of stripped topsoil from site however the contractor shall bear the cost to remove such soil as approved by the Owner.

5. Stockpile surplus topsoil to allow for landscaping per plans. Depths of topsoil in lawn areas can be deeper than what is specified if excess soils are available for the extra depths, however, the Civil engineer must approve this and determine that all grading and drainage requirements can still be met by having deeper topsoil depths in lawn areas. Consult with Owner and Civil Engineer on-site prior to site work to discuss this and determine appropriate course of action to be taken.

### **3.6 SITE IMPROVEMENTS**

- A. Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction. Refer to project plans for improvements to be abandoned in place.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
  1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
  2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

### **3.7 DISPOSAL**

- A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
  1. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

**END OF SECTION**

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## SECTION 31 2000

### EARTH MOVING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

A. This Section includes the following:

1. Preparing subgrades for slabs-on-grade, walks, pavements, lawns and grasses and exterior plants.
2. Subbase course for concrete walks and pavements.
3. Subbase and base course for asphalt paving.
4. Subsurface drainage backfill for walls and trenches.
5. Excavation and backfilling for buildings and structures.
6. Excavation and backfilling for utility trenches.

B. Related Sections include the following:

1. Division 1 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities.
2. Division 2 Section "Site Clearing" for temporary erosion and sedimentation control measures, site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
3. Division 2 Section "Dewatering" for lowering and disposing of ground water during construction.
4. Division 2 Section "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.
5. Division 2 Section "Exterior Plants" for planting bed establishment and tree and shrub pit excavation and planting.
6. Division 3 Section "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.

##### 1.2 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Course placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
  - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
  - 2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
  - 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. or more in volume that exceed a standard penetration resistance of 100 blows/2 inches when tested by an independent geotechnical testing agency, according to ASTM D 1586.
- I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- J. Subbase Course: Course placed between the subgrade and base course for hot-mix asphalt pavement, or course placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- K. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- L. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.
- M. Structural fill: Is fill material that will ultimately be subjected to any kind of structural loading, such as those imposed by footings, floor slabs, pavements, etc...

### **1.3 SUBMITTALS**

- A. Product Data: For the following:
  - 1. Each type of plastic warning tape.
- B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
  - 1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
  - 2. Laboratory compaction curve according to ASTM D 1557 for each on-site and borrow soil material proposed for fill and backfill.
- C. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

## 1.4 QUALITY ASSURANCE

- A. Preexcavation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

## 1.5 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.
  - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Architect's written permission.
  - 3. Contact utility-locator service for area where Project is located before excavating.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

## PART 2 - PRODUCTS

### 2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations. Use imported structural fill for structurally loaded areas and pavements. All earthwork shall be in accordance with the project geotechnical study.
- B. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
  - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Imported Structural Fill and Backfill: Naturally occurring or artificially graded mixture of sands and gravels, free of organics, vegetation, sod, trash, frozen materials, clay clods or other deleterious materials such as trash, frozen clods, clay clods, etc., with 100% passing the 4" sieve, 70-100% passing the No. ¾" sieve, 40-90% passing the No. 4 sieve, 15-60% passing the No. 40 sieve, 20% MAX material passing the No. 200 Sieve. Liquid Limit is set at 30 max and Plasticity Index is set at 10 max. Structural Fill should be well-graded and generally with a maximum particle size of 4 inches. On-site granular soils may be reutilized as structural site grading fill if free of deleterious material. *Please note, that the existing fine grained (clayey) soils, from a handling and compaction standpoint, are inherently more difficult to rework and are very sensitive to changes in moisture content requiring very close moisture control during placement and compaction. This will be very difficult, if not impossible, during wet and cold periods of the year to properly rework. Additionally, surficial fine-grained soils onsite are likely above optimum moisture content for compacting at present and would require some drying prior to recompacting. Therefore, their use as structural site grading fill may not be economical but may be better utilized in landscape areas. All fill material should be approved by a CMT geotechnical engineer prior to placement*

- E. Granular Imported Structural Fill and Backfill for Soft Areas: Soft spots to be removed and replaced with granular material for a minimum depth of 24 inches as indicated in the geotechnical report. Naturally occurring or artificially graded mixture of sands and gravels, free of organics, vegetation, sod, trash, frozen materials, clay clods or other deleterious materials such as trash, frozen clods, clay clods, etc., with material passing the No. 200 Sieve limited to 40%, well-graded and generally with a maximum particle size of 3 inches , but with occasional permissible particles up to 6 inches provided that they do not result in “honeycombing” or preclude achieving the required degree of compaction. The fines plasticity index shall be less than 15 and liquid limit less than 35. *All fill material should be approved by a CMT geotechnical engineer prior to placement*
- F. Base Course at all Site Concrete Work: Sound, crushed, or uncrushed rock or gravel and sand, well graded as follows: (refer to APWA specs for base course.)

| <u>Sieve</u> | <u>% by Weight Passing Sieve</u> |
|--------------|----------------------------------|
| 1 1/2"       | 100                              |
| 1"           | 90 -100                          |
| 3/4"         | 70 – 85                          |
| 1/2"         | 60 – 80                          |
| 3/8"         | 55 – 75                          |
| #4           | 40-65                            |
| #16          | 25 – 40                          |
| #200         | 7 – 11 (non-plastic)             |

Provide a 4 inch minimum of base course material beneath all site concrete work.

- G. Site Grading Fill: Placed below non-structural areas, such as landscaping and over larger areas to raise the site grade. On-site soils or imported soils, with a maximum particle size of 8 inches, including silt/clay soils not containing excessive amounts of degradable/organic material. *All fill material should be approved by a CMT geotechnical engineer prior to placement*
- H. Bedding Course: Type A-1-a or A-1-b (AASHTO Classifications soils per city requirements.)
- I. Drainage Course: Narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve. Provide a minimum of 4 inch depth under all concrete building slab areas or as shown on plans.
- J. Cobble Material: Naturally or artificially graded mixture of angular rock. 4” to 12” in diameter.
- K. Drain Rock: For Fill in submerged area 3” Minus washed rock and pea gravel material with 0-25 passing the No 10, 0-15 passing the No 40 and 0-5 passing the No 200 Non Plastic should be used. If free draining fill is adjacent to soil containing a significant amount of sand or silt/clay, precautions should be taken to prevent the migration of fine soil into the free drain fill. This would include the use of filter fabric between the two soil types. Fabric to be approved by geotechnical engineer.

## **2.2 ACCESSORIES**

- A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
1. Red: Electric.
  2. Yellow: Gas, oil, steam, and dangerous materials.
  3. Orange: Telephone and other communications.
  4. Blue: Water systems. All water systems to have detectable warning wire per notes on C100.
  5. Green: Sewer systems.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 2 Section "Site Clearing."
- C. Protect and maintain erosion and sedimentation controls, which are specified in Division 2 Section "Site Clearing," during earthwork operations.
- D. Provide protective insulating materials to protect subgrades and foundation soils against freezing temperatures or frost.

### **3.2 DEWATERING**

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Pump ground water out of excavations and dispose of ground water in accordance with City requirements.
- C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

### **3.3 EXPLOSIVES**

- A. Explosives: The use of explosives is NOT allowed, unless specifically permitted by City Officials.

### **3.4 EXCAVATION, GENERAL**

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
  - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

### **3.5 EXCAVATION FOR STRUCTURES**

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections. Refer to geotechnical report for the over excavation and depth of required structural fill for footing.
  - 1. Excavations for Footings and Foundations: – Refer to geotechnical report. Review excavation and gravel thickness with the Owners geotechnical engineer prior to proceeding with other work. The bottom of footing excavations should be compacted with at least 4 passes of a non-vibratory roller prior to erection of forms or placement of structural fill to densify soils that may have been loosened during excavation and to identify soft spots. If soft areas are encountered, they should be stabilized as recommended in in geotechnical report. If soft areas are encountered at the base of any excavations, the soft areas will be excavated and additional 24 inches minimum and backfilled with stabilization fill for soft areas. The width of the excavations to extend one foot horizontally beyond the footing perimeter for each two feet of vertical over excavation. Review excavation with Owners geotechnical engineer prior to backfill. Trim bottoms to required lines and grades to leave solid base to receive other work.

Structural fill used below foundations should extend laterally a minimum of 6 inches for every 12 vertical inches of structural fill placed. For example, if 18 inches of structural fill is required to bring the excavation to footing grade, the structural fill should extend laterally a minimum of 9 inches beyond the edge of the footings on both sides.
  - 2. Excavation for Underground Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces except to compact subgrade to 90% maximum laboratory density as determined by ASTM D 1557 or the percentage as indicated on plans. All utility system structures shall have a minimum of 8" compacted bedding or base course under the bottom of the structure.

### **3.6 EXCAVATION FOR WALKS AND PAVEMENTS**

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrade. Any non-native soils that do not meet the requirements laid out in the owners geotechnical report will be completely removed below any new pavement and backfilled with imported structural fill for soft areas. Proof roll as outlined in this section prior to placement of other work. As indicated in the geotechnical report concrete flatwork and slabs can be placed on undisturbed native soils after appropriate removals and grading.

### **3.7 EXCAVATION FOR UTILITY TRENCHES**

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
  - 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.
  - 1. Clearance: 12 inches each side of pipe or conduit.
- C. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.
  - 1. Excavate trenches 12 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
  - 2. Excavate 16 inches minimum deeper than the elevation required for utilities that are to be placed at or near ground water (within 12 inches of ground water) and backfill with 12" min of drainage rock for pipe stabilization. Place drainage fabric over drainage rock prior to placement of pipe bedding material. Wrap the pipe zone material in drainage fabric if the pipe is below ground water level. Coordinate with City inspector if additional measures are required for utility support.

### **3.8 SUBGRADE INSPECTION**

- A. Notify Architect when excavations have reached required subgrade.
- B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll subgrade below the building slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades. DO not route construction traffic over subgrade.
  - 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
  - 2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
  - 3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

- D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work. Soft spots caused by routing construction equipment over subgrade will be repaired without additional compensation.
- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

### **3.9 UNAUTHORIZED EXCAVATION**

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.
  - 1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

### **3.10 STORAGE OF SOIL MATERIALS**

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

### **3.11 BACKFILL**

- A. Place and compact backfill in excavations promptly, but not before completing the following:
  - 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
  - 2. Surveying locations of underground utilities for Record Documents.
  - 3. Testing and inspecting underground utilities.
  - 4. Removing concrete formwork.
  - 5. Removing trash and debris.
  - 6. Removing temporary shoring and bracing, and sheeting.
  - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.

### **3.12 UTILITY TRENCH BACKFILL**

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with bedding course material; fill with concrete to elevation of bottom of



footings. Concrete is specified in Division 03 Section "Cast-in-Place Concrete Miscellaneous Cast-in-Place Concrete."

- D. Place and compact initial backfill of subbase material, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
  - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- E. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- F. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

### **3.13 SOIL FILL**

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
  - 1. Under grass and planted areas, use approved native soil material or imported fill.
  - 2. Under walks and pavements, use approved native granular material or imported structural fill.
  - 3. Under steps and ramps, use engineered fill.
  - 4. Under building slabs or site pavement, use structural fill.
  - 5. Under footings and foundations, use structural fill.
  - 6. Under utility lines and utility structures, use bedding course material
  - 7. Pipe zone (bottom of pipe to 1 foot over the top of pipe), use bedding course material
- C. Place soil fill on subgrades free of mud, frost, snow, or ice.

### **3.14 SOIL MOISTURE CONTROL**

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
  - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
  - 2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

### **3.15 COMPACTION OF SOIL BACKFILLS AND FILLS**

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
  - 1. Under structures, building slabs, steps, and pavements, compact each layer of backfill or fill soil material at 95 percent. If there is greater than 5 feet of fill below structurally loaded areas compact to 98 percent.
  - 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.
  - 3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 90 percent. If there is greater than 5 feet of fill compact to 92 percent.
  - 4. For utility trenches, refer to City standards for utility trenching. All fill and compaction in utility trenches both onsite and offsite must meet these requirements.

### **3.16 GRADING**

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
  - 1. Provide a smooth transition between adjacent existing grades and new grades.
  - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
  - 1. Lawn or Unpaved Areas: Plus or minus 1 inch.
  - 2. Walks: Plus or minus 1/2 inch.
  - 3. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

### **3.17 SUBBASE AND BASE COURSES**

- A. Place subbase and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase and base course under pavements and walks as follows:
  - 1. Place base course material over subbase course under hot-mix asphalt pavement.
  - 2. Shape subbase and base course to required crown elevations and cross-slope grades.
  - 3. Place subbase and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
  - 4. Compact subbase and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

### **3.18 DRAINAGE COURSE**

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
  - 1. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick. Compact over drainage piping with 4 passes of smooth drum roller as required by pipe manufacture.
  - 2. Compact drainage course material using 4 passes of a smooth drum 5 ton vibratory roller or equivalent each layer to required thickness.

### **3.19 FIELD QUALITY CONTROL**

- A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
  - 1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than 3 tests.
  - 2. Foundation Wall Backfill: At each compacted backfill layer, at least 1 test for each 100 feet or less of wall length, but no fewer than 2 tests.
  - 3. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 150 feet or less of trench length, but no fewer than 2 tests.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

### **3.20 PROTECTION**

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.
- 3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS
- A. Disposal: Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.
1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

**END OF SECTION**

## SECTION 31 2216

### FINE GRADING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Includes But Not Limited To:
  - 1. Perform fine grading work required to prepare site for landscape finish grading and soil preparation as described in Contract Documents.
  - 2. Furnishing of imported topsoil for lawn and shrub beds.
- B. Related Sections:
  - 1. Section 31 0501: Common Site Construction Requirements.
  - 2. Section 32 9113: Finish grading and soil preparation for landscaping.

##### 1.2 REFERENCES

- A. American Society For Testing And Materials:
  - 1. ASTM D 1557-02, 'Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.'

##### 1.3 QUALITY ASSURANCE

- A. Pre-Installation Conference: Participate in pre-installation conference specified in Section 31 2213.

#### PART 2 - PRODUCTS - Not Used

#### PART 3 - EXECUTION

##### 3.1 EXAMINATION

- A. Do not commence work of this Section until grading tolerances specified in Section 31 2213 are met.

##### 3.2 PREPARATION

- A. Protection: Protect utilities and site elements from damage.
- B. Surface Preparation:
  - 1. Before grading, dig out weeds from planting areas by their roots and remove from site. Remove rocks larger than 1 inch in size and foreign matter such as building rubble, wire, cans, sticks, concrete, etc.
  - 2. Remove imported paving base material present in planting areas down to natural subgrade or other material acceptable to Architect.
  - 3. Limit use of heavy equipment to areas no closer than 6 feet from building or other permanent structures.

### **3.3 PERFORMANCE**

#### **A. Site Tolerances:**

1. Maximum variation from required grades shall be 1/10 of one foot.
2. To allow for final finish grades of planting areas, fine grade elevations before placing topsoil are:
  - a. Sod Areas: 7 inches below top of walk or curb.
  - b. Shrub Areas: 20 inches below top of walk or curb, except around the building. This allows for 12" depth of topsoil and an 8" depth of rock mulch. Finish grade elevations around the building where curb exists are to be 26 inches below top of curb. This allows for 12" depth of topsoil, 8" depth of rock mulch and 6" below curb.

B. Do not expose or damage existing shrub or tree roots.

C. Distribute approved imported topsoil. Remove organic material, rocks and clods greater than 1-1/2 inch in any dimension, and other objectionable materials.

D. Slope grade away from building for 12 feet minimum from walls at slope of 1/2 inch in 12 inches minimum unless otherwise noted. Direct surface drainage in manner indicated on Drawings by molding surface to facilitate natural run-off of water. Fill low spots and pockets with specified fill material and grade to drain properly.

**END OF SECTION**

## **DIVISION 32 – EXTERIOR IMPROVEMENTS**

|                 |   |
|-----------------|---|
| Section 32 0101 | Plant Maintenance                           |
| Section 32 1216 | Hot-Mix Asphalt Paving                      |
| Section 32 1313 | Site Concrete                               |
| Section 32 1373 | Concrete Paving Joint Sealants              |
| Section 32 1813 | Synthetic Grass                             |
| Section 32 1816 | Playground Surface Systems                  |
| Section 32 3113 | Chain Link Fences and Gates                 |
| Section 32 3119 | Decorative Iron Fencing                     |
| Section 32 3300 | Site and Street Furnishings                 |
| Section 32 7000 | General Landscape Site Work<br>Requirements |
| Section 32 8423 | Underground Sprinklers                      |
| Section 32 9001 | Common Planting Requirements                |
| Section 32 9113 | Finish Grading and Soil Preparation         |
| Section 32 9223 | Lawn Sodding                                |
| Section 32 9300 | Exterior Plants                             |

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## SECTION 32 0101

### PLANT MAINTENANCE

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Includes But Not Limited To:
  - 1. Provide maintenance for new landscaping as described in Contract Documents.
- B. Related Sections:
  - 1. Section 32 9001: Common Planting Requirements.

#### PART 2 - PRODUCTS: Not Used

#### PART 3 - EXECUTION

##### 3.1 PERFORMANCE

- A. General:
  - 1. Before beginning maintenance period, plants shall be in at least as sound, healthy, vigorous, and in approved condition as when delivered to site, unless accepted by Architect in writing at final landscape inspection
  - 2. Maintain landscaping from completion of landscape installation to 30 days after Substantial Completion Meeting.
  - 3. Replace landscaping that is dead or appears unhealthy or non-vigorous as directed by Architect during and at end of maintenance period. Make replacements within 10 days of notification.
- B. Sodded Lawn:
  - 1. Maintain sodded lawn areas until lawn complies with specified requirements and throughout maintenance period.
  - 2. Water sodded areas in sufficient quantities and at required frequency to maintain sub-soil immediately under sod continuously moist 3 to 4 inches deep.
  - 3. Cut grass first time when it reaches 3 inches high. Continue to mow at least once each week throughout maintenance period with a minimum of 4 mowings or until lawn is approved by Landscape Architect. Remove clippings.
  - 4. Apply weed killer as necessary to maintain weed-free lawn. Apply weed killer in accordance with manufacturer's instructions during calm weather when air temperature is between 50 and 80 deg F.
  - 5. At end of 30 day maintenance period, fertilize lawns as recommended in Section 32 9113.
- C. Trees, Shrubs, And Plants:
  - 1. Maintain by pruning, cultivating, and weeding as required for healthy growth.
  - 2. Restore planting basins.
  - 3. Tighten and repair stake and guy supports and reset trees and shrubs to proper grades or vertical positions as required.
  - 4. Spray as required to keep trees and shrubs free of insects and disease.
  - 5. Provide supplemental water by hand as needed in addition to water from sprinkling system.

**END OF SECTION**

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## SECTION 32 1216

### HOT-MIX ASPHALT PAVING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Asphalt paving.
  - 2. Pavement-marking.
- B. Related Sections include the following:
  - 1. Division 2 Section "Earthwork" for aggregate subbase and base courses and for aggregate pavement shoulders.

##### 1.2 DEFINITIONS

- A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.
- B. DOT: Department of Transportation.

##### 1.3 SYSTEM DESCRIPTION

- A. Provide hot-mix asphalt paving according to materials, workmanship, and other applicable requirements of standard specifications of state or local DOT.
  - 1. Standard Specification: Comply with APWA specifications, Latest edition, and with local governing regulations of more stringent than herein specified.
  - 2. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

##### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
- B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
- C. Qualification Data: For manufacturer.
- D. Material Test Reports: For each paving material.
- E. Material Certificates: For each paving material, signed by manufacturers.

## 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer.
1. Manufacturer shall be a paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of the state of Utah.
- B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated, as documented according to ASTM E 548.
- C. The OWNER will engage materials testing service for quality control during base and asphalt placement operations.
- D. Contractor Responsibility for Testing: Advise testing agency sufficiently in advance of operations to allow for completion of quality tests, and for assignment of personnel.
- Deliver samplers of proposed base materials to testing agency for analysis and approval.
- Assist testing agency representative to safely have access to the site during placement operations
- E. Frequency of Tests: Owner's testing agency will be instructed to conduct field density tests of materials as follows:
- Aggregate Base Course: Conduct one test for each 1000 square feet of each lift of material completed to 95% minimum of maximum dry density determined b ASTM D 1557-78.
- Asphaltic Surface Course: Conduct one test for each 1000 square feet of material compacted to 96% minimum of design density as determined by ASTM D 1559-78 (Marshall Method).
- F. Grade Control: Establish and maintain required lines and elevations... Lay base course within plus or minus 1/4 inch in 10 feet of required elevations.
- G. Asphalt-Paving Publication: Comply with AI MS-22, "Construction of Hot Mix Asphalt Pavements," unless more stringent requirements are indicated.
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

## 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp or if the following conditions are not met:
1. Tack Coats: Minimum surface temperature of 60 deg F.
  2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
  3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

## **PART 2 - PRODUCTS**

### **2.1 AGGREGATES**

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or properly cured, crushed blast-furnace slag.
- C. Fine Aggregate: ASTM D 1073, sharp-edged natural sand or sand prepared from stone, gravel, properly cured blast-furnace slag, or combinations thereof.
  - 1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.
- D. Mineral Filler: ASTM D 242, rock or slag dust, hydraulic cement, or other inert material.

### **2.2 ASPHALT MATERIALS**

- A. Asphalt Cement: ASTM D 3381 for viscosity-graded material, use AC-10. ASTM D 6373 for penetration-graded material, use PG 58-22 or PG58-28 per current APWA Specifications.
- B. Tack Coat: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.
- C. Water: Potable.
- D. Undersealing Asphalt: ASTM D 3141, pumping consistency.

### **2.3 AUXILIARY MATERIALS**

- A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.

### **2.4 MIXES**

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction; designed according to procedures in AI MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types"; and complying with the following requirements:
  - 1. Provide mixes to comply with the APWA Standards.
  - 2. 1/2 inch aggregate for parking areas, playgrounds and access roadways.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.

- B. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.
- C. Proceed with paving only after unsatisfactory conditions have been corrected.

### **3.2 REPAIRS**

- A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.
  - 1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.
- B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch.
  - 1. Clean cracks and joints in existing hot-mix asphalt pavement.
  - 2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

### **3.3 SURFACE PREPARATION**

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
  - 1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
  - 1. Mix herbicide formulated by manufacturer for that purpose.
- C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal. /sq. yd.
  - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
  - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

### **3.4 HOT-MIX ASPHALT PLACING**

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
  - 1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
  - 2. Place hot-mix asphalt surface course in single lift.
  - 3. Spread mix at minimum temperature of 250 deg F.
  - 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.

5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

### **3.5 JOINTS**

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.
1. Clean contact surfaces and apply tack coat to joints.
  2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
  3. Offset transverse joints, in successive courses, a minimum of 24 inches.
  4. Construct transverse joints as described in AI MS-22, "Construction of Hot Mix Asphalt Pavements."
  5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
  6. Compact asphalt at joints to a density within 2 percent of specified course density.

### **3.6 COMPACTION**

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.
1. Complete compaction before mix temperature cools to 185 deg F.
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
1. Average Density: 96 percent of reference laboratory density according to AASHTO T 245, but not less than 94 percent nor greater than 100 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

### **3.7 INSTALLATION TOLERANCES**

- A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:
  - 1. Base Course: Plus or minus 1/2 inch.
  - 2. Surface Course: Plus 1/4 inch, no minus.
- B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
  - 1. Base Course: 1/4 inch.
  - 2. Surface Course: 1/8 inch.
  - 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

### **3.8 FIELD QUALITY CONTROL**

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.
  - 1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.
- B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- E. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979.
  - 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
  - 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
    - a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.



- F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

### **3.9 DISPOSAL**

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.
  - 1. Do not allow excavated materials to accumulate on-site.

**END OF SECTION**

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## SECTION 32 1313

### SITE CONCRETE

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes exterior cement concrete pavement for the following:
  - 1. Driveways and concrete pads
  - 2. Curbs and gutters
  - 3. Walkways
  - 4. Stairs and retaining walls.

##### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete pavement mixture.

##### 1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94 requirements for production facilities and equipment.
- B. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

#### PART 2 - PRODUCTS

##### 2.1 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout the Project:
  - 1. Portland Cement: ASTM C 150, Type II, gray.
- B. Normal-Weight Aggregates: ASTM C 33, Class 4S coarse aggregate, uniformly graded. Provide aggregates from a single source.
- C. Water: ASTM C 94.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Chemical Admixtures: ASTM C 494, of type suitable for application, certified by manufacturer to be compatible with other admixtures and to contain no more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

##### 2.2 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth.

- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

## **2.3 RELATED MATERIALS**

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

## **2.4 STEEL REINFORCEMENT**

- A. Epoxy-Coated Reinforcing Bars: ASTM A 615, Grade 60, deformed bars, ASTM A 775, epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.
- B. Bar Supports: bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars or dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice".
- C. At concrete slabs, sidewalks, stairs, and retaining walls, use fiberglass reinforcing bars, equal to Owens Corning "Pinkbar+ Fiberglass Rebar". Coordinate bar sizes with Drawings and conditions of use.

## **2.5 CONCRETE MIXTURES**

- A. Prepare design mixtures, proportioned according to ACI 301, with the following properties:
  - 1. Compressive Strength (28 Days): 4000 psi.
  - 2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
  - 3. Slump Limit: 4 inches, plus or minus 1 inch.
  - 4. Air Content: 6-1/2 percent plus or minus 1.5 percent.
  - 5. Cement: 6-1/2 bag mix.

## **2.6 CONCRETE MIXING**

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94. Furnish batch certificates for each batch discharged and used in the Work.

# **PART 3 - EXECUTION**

## **3.1 EXAMINATION**

- A. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.

### **3.2 EDGE FORMS AND SCREED CONSTRUCTION**

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to require lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

### **3.3 STEEL REINFORCEMENT**

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement embedded in concrete flatwork.

### **3.4 JOINTS**

- A. General: Form construction, isolation, and contraction joints and tool edging true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness to match jointing of existing adjacent concrete pavement.
- E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

### **3.5 CONCRETE PLACEMENT**

- A. Moisten subbase to provide a uniform dampened condition at time concrete is placed.
- B. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- D. Screed pavement surfaces with a straightedge and strike off.
- E. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

### **3.6 FLOAT FINISHING**

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
  - 1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

### **3.7 CONCRETE PROTECTION AND CURING**

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- A. Comply with ACI 306.1 for cold-weather protection.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. Ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screening, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these methods.

### **3.8 PAVEMENT TOLERANCES**

- A. Comply with tolerances of ACI 117 and as follows:

Elevation: 1/4 inch.

Thickness: Plus 3/8 inch, minus 1/4 inch.

Surface: Gap below 10-foot-long, unlevelled straightedge not to exceed 1/4 inch.

Joint Spacing: 3 inches.

Contraction Joint Depth: Plus 1/4 inch, no minus.

Joint Width: Plus 1/8 inch, no minus.

### **3.9 REPAIRS AND PROTECTION**

- A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.
- B. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement.
- C. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

**END OF SECTION**

## SECTION 32 1373

### CONCRETE PAVING JOINT SEALANTS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Cold-applied joint sealants.
  - 2. Hot-applied joint sealants.

##### 1.2 PRECONSTRUCTION TESTING

- A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, eight, Samples of materials that will contact or affect joint sealants. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

##### 1.3 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples: For each kind and color of joint sealant required.
- C. Pavement-Joint-Sealant Schedule: Include the following information:
  - 1. Joint-sealant application, joint location, and designation.
  - 2. Joint-sealant manufacturer and product name.
  - 3. Joint-sealant formulation.
  - 4. Joint-sealant color.
- D. Product certificates.
- E. Product test reports.
- F. Preconstruction compatibility and adhesion test reports.

##### 1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021.
- B. Preinstallation Conference: Conduct conference at Project site.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

### **2.2 COLD-APPLIED JOINT SEALANTS**

- A. Single-Component, Nonsag, Silicone Joint Sealant for Concrete: ASTM D 5893, Type NS.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Crafcro Inc., an ERGON company; RoadSaver Silicone.
    - b. Dow Corning Corporation; 888.
    - c. Pecora Corporation; 301 NS.
- B. Single-Component, Self-Leveling, Silicone Joint Sealant for Concrete: ASTM D 5893, Type SL.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Crafcro Inc., an ERGON company; RoadSaver Silicone SL.
    - b. Dow Corning Corporation; 890-SL.
    - c. Pecora Corporation; 300 SL.
- C. Multicomponent, Pourable, Traffic-Grade, Urethane Joint Sealant for Concrete: ASTM C 920, Type M, Grade P, Class 25, for Use T.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Pecora Corporation; Urexpan NR-200.

### **2.3 HOT-APPLIED JOINT SEALANTS**

- A. Hot-Applied, Single-Component Joint Sealant for Concrete: ASTM D 3406.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Crafcro Inc., an ERGON company; Superseal 444/777.
- B. Hot-Applied, Single-Component Joint Sealant for Concrete and Asphalt: ASTM D 6690, Types I, II, and III.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Meadows, W. R., Inc.; Sealtight Hi-Spec or Sealtight 3405.



- b. Right Pointe; D-3405 Hot Applied Sealant.

## **2.4 JOINT-SEALANT BACKER MATERIALS**

- A. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.
- B. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D 5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.
- C. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

## **2.5 PRIMERS**

- A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

# **PART 3 - EXECUTION**

## **3.1 INSTALLATION**

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Cleaning of Joints: Clean out joints immediately before installing joint sealants.
- C. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- D. Install joint-sealant backings of kind indicated to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of joint-sealant backings.
  - 2. Do not stretch, twist, puncture, or tear joint-sealant backings.
  - 3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Install joint sealants using proven techniques that comply with the following and at the same time backings are installed:
  - 1. Place joint sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses in each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

- F. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:
1. Remove excess joint sealant from surfaces adjacent to joints.
  2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- G. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.
- H. Clean off excess joint sealant or sealant smears adjacent to joints as the Work progresses, by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

**END OF SECTION**

## SECTION 32 1813

### SYNTHETIC GRASS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

##### 1.2 DESCRIPTION OF WORK

- A. The Contractor shall provide all labor, materials, equipment and tools necessary for the complete installation of an infilled synthetic grass field surface with a stable draining base for the areas shown on the plans as synthetic grass. The complete synthetic grass field system shall consist of, but not necessarily be limited to, the following:
  1. Field construction with the extent of artificial turf work as shown on the Drawings.
  2. Subgrade, base, and drainage construction as specified in Section 2 and Section 3 of this document.
  3. Quality synthetic grass product manufactured in the USA according to specifications in Section 2 of this document. Product shall meet or exceed all guidelines as established herein, or for characteristics not specifically stated, shall meet or exceed all guidelines published by the Synthetic Turf Council.
  4. The synthetic grass field shall be specifically designed, manufactured and installed for the intended sports and events.
  5. A resilient infill system, consisting of 20/50 sand infill
  6. Pre-manufactured porous resilient shock pad at playground equipment and where shown on Drawings.
  7. Ongoing warranty and preventative maintenance service shall be included in contract. The warranty shall be for a period of 20 years from date of substantial completion. During this warranty period, contractor shall also provide preventative maintenance and grooming during two (2) scheduled on site visits each year of the warranty period.

##### 1.3 SYSTEM PERFORMANCE

- A. Contractor shall ensure that products and field system meet the following performance requirements:
  1. All components and their installation method shall be designed and manufactured for use on outdoor play fields and beneath play structures. The materials as hereinafter specified shall withstand full climatic exposure in the location of the field, be resistant to insect infestation, rot, fungus, mold and mildew; it shall also withstand ultra-violet rays and extreme heat; the free flow of water vertically through the playing surface and into the drainage system below the surface.
  2. The seams of all system components shall provide a permanent, tight, secure, and hazard free playing surface.
  3. The installed synthetic grass field and drainage system shall allow for drainage and water flow through the system at a rate of not less than 10 inches per hour.
  4. System shall meet fall height protection requirements per ASTM guidelines.

#### 1.4 SERVICE AND QUALITY ASSURANCE:

- A. Synthetic grass vendor shall provide ongoing service quality assurance and warranty consisting of, but not necessarily be limited to, the following:
1. The synthetic grass vendor and contractor must be experienced in the manufacturing and installation of synthetic grass field systems and have completed a minimum of three similar systems, a minimum of 10,000 sf each in Utah in the 2018 season
  2. The synthetic grass vendor must be a current member in good standing of the Synthetic Turf Council (STC)
  3. The synthetic grass vendor must provide competent workmen skilled in this type of field installation. The synthetic grass vendor shall provide a qualified installation foreman to coordinate and review the component parts of the synthetic grass system. Foreman shall be introduced to Owner or Owner's representative prior to start of construction.
  4. The synthetic grass vendor shall provide a written letter or resume confirming that the installation crew and foreman are certified as competent in the installation of this material, including attachment of seams and proper installation of infill material prior to the start of turf installation.
  5. Application and grooming of infill must be done using turf equipment.
    - a. Provide full coverage of materials and workmanship for a minimum of 20 years for the date of substantial completion.
    - b. Warrant that the materials installed meet or exceed the product specifications.
    - c. Cover defects in the installation and workmanship.
    - d. Repair or replace such portions of the installed materials that are no longer serviceable to maintain a useable and playable surface.
    - e. Be from a single source covering workmanship and all materials.
    - f. Assure the availability of exact or substantially the same replacement materials for the synthetic grass system for the full warranty period.
    - g. Include general wear and damage caused by UV degradation. The warranty may specifically exclude vandalism and Acts of God beyond the control of the manufacturer or installer.

#### 1.5 SUBMITTALS

- A. **Synthetic Grass Vendor** must submit the following to Owner or Owner's Representative with the official bid package:
1. One copy of the most recent installation reference list for projects of similar scope to this project completed in last year 2018
  2. One 12 x 12 inch loose sample of proposed synthetic grass product and one 12 x 12 inch boxed sample including infill representative of finished synthetic grass field system.
  3. One of the product warranty for proposed synthetic grass product.
  4. One copy of their maintenance instructions. These instructions will include all necessary instructions for the proper care and maintenance of the newly installed synthetic turf system.
  5. One copy of edge details of proposed installation and terminations of synthetic grass field system.
  6. One copy of a signed letter from synthetic grass vendor certifying that the proposed synthetic grass product is manufactured in the USA, Must have a 20 YEAR WARRANTY
  7. One copy of independent laboratory test reports on system or components:
    - a. ASTM D-5848 – pile height, tuft spacing, face weight and total weight
    - b. ASTM D-1335 – tuft Bind
    - c. ASTM D-5034 – grab tear breaking strength
    - d. ASTM D-2859 – flammability (pill test)

- e. ASTM F-1551 – water permeability
- f. ASTM F 1551 – shoe traction
- g. ASTM F-1015 – abrasive Index

- B. Synthetic Grass Vendor must submit the following** prior to commencing construction of the synthetic grass field system:
- 1. One (1) copy of material certificates and samples for materials that will be used on the project. Each material certificate must be marked as approved by the synthetic grass contractor.
  - 2. The following representative samples of the following components that will be used on the synthetic grass field system for approval by Owner or Owner’s Representative:
    - a. One 12 x 12 inch sample of synthetic grass product.
    - b. One sample of each colored yarn proposed for use in field markings and logos.
    - c. One pint of resilient infill material.
    - d. One 12 x 12 inch samples of resilient shock pad.
    - e. One set of construction diagrams to include: seam layout plan, edge details, and any details of construction that deviate from the original plans and specifications.
    - f. One Coordinate with Owner or Owner’s Representative to get final approval of all designated colors, dimensions and logo/lettering designs.
    - g. One construction project plan to include: project timeline with details and dates of each phase of construction; identification and contact information for project foreman; a letter from the turf manufacturer that the installation crew and foreman are certified as competent in the installation of this material.

**PART 2 - PRODUCT SPECIFICATIONS**

**2.1 BASE MATERIALS**

- A. Excavation, drainage, and base construction shall be as directed per Engineer’s drawings.

**2.2 POROUS SHOCK PAD:**

- A. Light density foam pad of sufficient thickness to meet fall height requirements.

**2.3 SYNTHETIC PRODUCT**

- A. Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other manufacturers may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
  - 1. Manufacturer/Supplier: Rocky Mountain Artificial Turf
  - 2. System: Xtreme Play.
- B. Properties
  - 1. Synthetic grass product specifications: WARRANTY 20 YEARS
    - a. Yarn Type #1: 350 DM monofilament
      - 1) Yarn Color: Field green /Lime
      - 2) Yarn Denier: 10,800 (1800/6)
      - 3) Thickness / Form: Approx. 350 micron diamond shape.

- 4) Product Description: Proprietary PE formulation for superior wear resistance.
  - b. Yarn Type #2: Texturized thatch
    - 1) Yarn Color: Field green/Tan
    - 2) Yarn Denier: 6000(1000/6)
    - 3) Product Description: Texturized monofilament PE thatch.
  - c. Total Yarn Face Weight: 60 Oz. / SqYd
  - d. Primary Backing #1: 13 pic polybac
  - e. Primary Backing #1: 13 pic polybac
  - f. Primary Backing Weight: 7 oz. / SqYd
  - g. Secondary Coating: 20 Oz. Urethane / SqYd
  - h. Total Product Weight: 87 Oz. / SqYd
2. Tufting Information:
    - a. Pile Height: 1-1/8 inch tufted, approx. 1 inch finished
    - b. Stitch Rate: As required
    - c. Tufting Gauge: 3/8 inch
    - d. Roll Widths: 15'-0"
    - e. Drainage Perforations: Standard 3 x 4 inch pattern
  3. Turf shall be available in multiple colors, including solids, as selected by Architect from manufacturer's full range.

## PART 3 - EXECUTION

### 3.1 BASE AND DRAINAGE CONSTRUCTION

- A. The synthetic grass base contractor shall strictly adhere to the installation procedures outlined under this section and by the Engineer's drawings. Any variance from these requirements must be accepted in writing, by the synthetic grass vendor, and submitted to the Owner or Owner's Representative, verifying that the changes do not adversely affect the performance or warranty.
  1. Excavation: The sub grade shall also be compacted and proof rolled to a minimum of a 90 percent compaction rate and be accepted in writing by the synthetic grass vendor, and submitted to the Owner or Owner's Representative, verifying that the changes do not adversely affect the performance or warranty.
  2. Install geotextile fabric over excavated and prepared sub-grade in accordance
  3. Trenching, Drainage Pipe Installation and Backfilling: All piping shall be as specified and connected by manufacturer's couplers, plugs etc.
    - a. The base grade shall be shaped to mirror the finished grade and approved by the Architect and/or Owner's Representative. The Base Contractor shall begin layout and trenching for the drainage network as indicated on the drainage plan and all details that apply. Collector lines shall be installed before lateral lines and shall begin with the deepest elevations. Collector lines shall be connected to discharge outlet at the onset of operations. Trenching progress shall work upward in elevation to allow for immediate discharge of water from the entire field in the event of a rainfall.
    - b. No trenches, with or without pipe, shall be permitted, to remain unfilled overnight and/or while crews are not progressively working on site.
    - c. All perimeter trenches must be dug in accordance with the field drainage plan details.
    - d. After all collector and lateral lines have been installed, the contractor shall repair any sub grade undulations prior to installing geotextile fabric.
  4. Concrete header curb and pressure treated wood nailer board: The synthetic turf perimeter fastening structure shall be installed before the drainage aggregate.
    - a. The 6 x 12 inch concrete header curb shall be installed in accordance with the drawings and these specifications. The foundation of the

- concrete header curb shall be a compacted free draining aggregate. Future water entering the foundation shall have a free draining path directly to the perimeter collector pipe.
- b. Install a composite lumber 2 x 4 inch nailer board. Nailer board shall be set 1 inch below top of the curb/sidewalk by means of a Tapcon every 12 inches. This shall be the responsibility of the synthetic turf base contractor. See synthetic turf edge attachment detail.
5. Base Drainage Aggregate: The installation of the base drainage aggregate shall only begin after the drainage pipe installation has been inspected and approved by Owner's Representative. Installation of the free draining base Aggregate shall follow procedures that protect the base grade soils and drainage pipe. The drainage pipe network and its existing elevations shall not be disrupted through ground pressures from trucks, dozers or by any other means.
- a. The base grade subsoil shall be dry before undertaking the placement of base aggregate.
  - b. Delivery trucks shall enter the field only from the designated entrance point. Base course stone shall be dumped closest to the entrance first and continuously worked towards the furthest point of the field. Extreme care must be taken not to disturb sub grade or drainage network.
  - c. Track-type dozers shall push out the stone from behind the pile onto and toward the field center. Dozers shall only traffic the aggregate they are spreading.
  - d. Care shall be taken not to disturb or contact the base grade soils with the dozer blades or tracks. All equipment trafficking over the drainage aggregate shall insure there is a minimum depth of 4 inches.
  - e. When the aggregate spreading is completed the surface shall be further firmed by a 5-ton roller.
  - f. The stone shall be left firm, but not over-compacted as to protect the porosity and drainage capabilities of the aggregate profile.
  - g. After the drainage stone has been uniformly spread throughout the surface, the surface shall receive a final laser finished grade. This process shall be accomplished using a turf-type tractor, or lightweight grader, equipped with high flotation tires and a hydraulically controlled laser blade.
  - h. The free draining base course should be designed to meet local soil and weather conditions. It must be installed to a minimum depth of 6 inches and shall be independently tested for an overall compaction rate of 95 percent proctor.
6. Approval of finished grade. The finished grade of the stone base shall not vary more than 1/4 inch over 10 feet. The base must be accepted in writing, by the synthetic grass contractor, and submitted to the Owner or Owner's Representative, prior to mobilization of equipment off the jobsite.

### **3.2 SYNTHETIC GRASS SYSTEM INSTALLATION**

- A. After a final inspection of the stone base by the synthetic grass contractor and the Owner's Representative, the synthetic turf installation shall begin. The synthetic grass product shall be delivered in 15-foot wide rolls with the 4 inch white, football 5-yard lines tufted into each roll (if applicable). The perimeter field lines shall also be tufted into the individual sideline rolls. The rolls shall be of sufficient length to go from sideline to sideline.
- B. Begin synthetic grass rolls with the longest perpendicular cross-field distance and should follow the following procedures:
  1. No head seams shall be permitted in the inbound playing surface unless required for field markings or logos.

2. Synthetic grass should be rolled out a minimum of four hours prior to starting seaming procedures and allowed to relax/expand.
  3. All visible wrinkles shall be stretched out before seaming.
  4. Yard lines and field markings should be straight and set with precision. Variance of field markings from specifications and diagrams should not exceed 1/8"
- C. Join synthetic grass rolls via micro-mechanical bond seaming and reinforced with specialty turf adhesive where necessary.
1. Seams shall be flat, tight and permanent with no separation or fraying.
  2. Seams shall be rolled with weighted roller to ensure adhesion.
  3. Synthetic turf yarn fabric that is trapped or glued between seams shall be freed from the seams by hand or other approved method to an upright position prior to the commencement of brushing and top dressing synthetic grass rolls by the manufacturer wherever possible.
- D. Tufted and Inlaid Lines (As shown on Drawings)
1. Layout and descriptions of tufted inlaid and/or painted lines shall be as indicated on final drawings.
  2. Inlaid lines and field markings shall be cut in using seaming methods recommended by the synthetic turf contractor.
  3. Yard lines and field markings should straight and set with precision. A transit should be used to ensure the line is accurate. Tolerances between any yard makers should not exceed 1/8 inch.
- E. Synthetic Turf Perimeter Attachment:
1. After final layout and seaming of the synthetic grass product, the edges should be precision trimmed to meet the surface exterior to the field.
  2. The turf shall be attached to the pressure treated wood nailer board by 1 inch lag crown stainless steel staples.
- F. Infill Application:
1. After all seaming is completed and inlaid lines, logos and lettering have been installed; the infill materials shall be applied evenly using an all-in-one metered device such as the SMG Sandmatic machine to ensure precise application of the infill and grooming of the grass to exact tolerances.
  2. Crumb rubber shall be applied in a uniform rate of multiple applications until the specified infill depth is achieved.
  3. After completion of the infill application, the infill depth should be checked to verify that the variance in infill depth does not exceed 0.2 inch at any given point across the entire field.

### **3.3 CLOSEOUT**

- A. The synthetic grass vendor must verify that a qualified representative has inspected the installation and that the finished field surface conforms to the manufacturer's requirements.
- B. The synthetic grass vendor and base construction contractor to coordinate to make sure goal posts are adjusted to achieve 10 ft. height above finished playing surface.
- C. The synthetic grass vendor must provide the Owner with the Stihl power brush
- D. Prior to Final Acceptance, the synthetic turf vendor shall submit to the Owner three (3) copies of their maintenance instructions. These instructions will include all necessary



instructions for the proper care and maintenance of the newly installed synthetic grass system.

- E. Synthetic grass contractor must train Owner's designated field personnel in proper grooming and care procedures. This includes training field personnel how to properly use grooming equipment as well as make minor repairs.
- F. Extra materials: Owner shall be given option to retain and store excess materials such as excess turf and infill ordered for project, but not installed.
- G. Ongoing warranty and preventative maintenance service shall be included in contract. The warranty shall be for a period of 20 years from date of substantial completion. During this warranty period, contractor shall also provide preventative maintenance and grooming during two (2) scheduled on site visits each year of the warranty period.

### **3.4 CLEAN UP**

- A. Contractor shall provide the labor, supplies and equipment as necessary for final cleaning of surfaces and installed items.
- B. All usable remnants of new material shall be neatly rolled up and turned over to the Owner at a place and area designated by the Owner.
- C. During the contract and at intervals as directed by the Owner or Owner's Representative and as synthetic grass system installation is completed, clear the site of all extraneous materials, rubbish, or debris and leave the site in a clean, safe, well-draining, neat condition.
- D. Surfaces, recesses, enclosures, etc. shall be cleaned as necessary to leave the work area in a clean, immaculate condition ready for immediate occupancy and use by the Owner.

**END OF SECTION**

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## SECTION 32 1816

### PLAYGROUND SURFACE SYSTEMS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Playground surfacing.
- B. Related Sections include the following:
  - 1. Section 11 6813 "Playground Equipment and Structures" for play structures installed only over protective use zones, at appropriate fall heights.
  - 2. Section 31 1000 "Site Clearing" for stripping, grubbing, removing topsoil, and protecting trees to remain.
  - 3. Section 31 2000 "Earth Moving" for drainage/separation geotextiles and sub-base courses.

##### 1.3 DEFINITIONS

- A. Critical Height: Standard measure of shock attenuation. According to CPSC No. 325, this means "the fall height below which a life-threatening head injury would not be expected to occur."
- B. Fall Height: According to ASTM F 1487, this means "the vertical distance between a designated play surface and the protective surfacing beneath it." The fall height of playground equipment should not exceed the Critical Height of the protective surfacing beneath it.
- C. SBR: Styrene butadiene rubber.
- D. Use Zone: According to ASTM F 1487, this means "the area beneath and immediately adjacent to a play structure that is designated for unrestricted circulation around the equipment and on whose surface it is predicted that a user would land when falling from or exiting the equipment."

##### 1.4 PERFORMANCE REQUIREMENTS

- A. Impact Attenuation: According to ASTM F 1292.
- B. Accessibility of Surface Systems: According to ASTM F 1951.

##### 1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include material descriptions and construction details for each component of playground surface system.

- B. Shop Drawings: Show the following:
  1. Installation details for curbs, ramps, and accessories.
  2. Colors and pattern of surfaces.
  3. Penetration Details.
- C. Samples for Selection: For each type of playground surface system indicated.
  1. Include similar Samples of playground surface system and accessories involving color selection.
- D. Qualification Data: For Installer.
- E. Material Test Reports: From a qualified testing agency, indicating compliance with requirements.
- F. Maintenance Data: For playground surface system to include in maintenance manuals.
- G. Warranty: Special warranty specified in this Section.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain playground surface system materials through one source from a single manufacturer.
  1. Provide secondary materials including geosynthetics, and repair materials of type and from source recommended by manufacturer of playground surface system materials.
- C. Standards and Guidelines: Provide playground surface systems complying with applicable provisions of the following, unless more stringent provisions are indicated:
  1. CPSC No. 325, "Handbook for Public Playground Safety"; ASTM F 1292; and ASTM F 1487.

## 1.7 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit playground surface system installation to be performed according to manufacturers' written instructions and warranty requirements.
- B. Environmental Limitations: Do not apply playground surface system materials or components over wet, frozen, or excessively damp substrates if prohibited by manufacturer's written instructions.
- C. Field Measurements: Where playground surface system is indicated to fit to other construction, verify dimensions of other construction by field measurements.
- D. Poured-in-Place Products:
  1. Apply materials only when temperature of surfaces to be adhered to and ambient air temperatures are within range permitted by manufacturer's written instructions.
  2. Close area to traffic during surfacing installation and for time period after installation recommended in writing by manufacturer.
  3. Do not install products over asphalt paving until paving is sufficiently cured to bond with adhesive.

4. Do not install products over concrete slabs until slabs have cured and are sufficiently dry and surfaces are within acceptable pH range to bond with adhesive, as determined by surfacing manufacturer's recommended procedures.

## **1.8 COORDINATION**

- A. Coordinate installation of playground surface systems with installation of playground equipment specified in Section 11 6813 "Playground Equipment and Structures."

## **1.9 WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of playground surface system which fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Reduction in impact attenuation.
    - b. Deterioration of surface and other materials beyond normal weathering.
  2. Warranty Period: Ten years from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Acceptable Manufacturer: Subject to compliance with requirements of Contract Documents, provide product by manufacturer listed below.
  1. Manufacturer: Surface America, Inc.
  2. Product: PlayBound Poured-In-Place, "Extreme-10".

### **2.2 PLAYGROUND SURFACE SYSTEMS, GENERAL**

- A. Accessibility: Provide playground surface systems determined to be accessible when tested according to ASTM PS 83 and designed to comply with requirements for an accessible route as recommended by ANSI A117.1 for systems designated.

### **2.3 POURED-IN-PLACE PLAYGROUND SURFACING SYSTEM**

- A. Description:
  1. Primer: Urethane.
  2. Basemat:
    - a. Blend of 100 percent recycled SBR (styrene butadiene rubber) and urethane; 14 percent urethane, 86 percent rubber.
    - b. Thickness: As determined by manufacturer, based on ASTM F1292 requirements for critical fall height but not less than 1-1/2 inches.
    - c. Formulation Components: Blend of strand and granular material.
  3. Top Surface:
    - a. Blend of recycled EPDM (ethylene propylene diene monomer) rubber and aliphatic urethane binder; 18 percent urethane, 82 percent rubber.
    - b. Thickness: As determined by manufacturer, based on ASTM F1292 requirements for critical fall height but not less than 1/2 inch.
    - c. Colors: As selected by Architect from manufacturer's full range; a minimum of three colors shall be selected.
    - d. Dry Static Coefficient of Friction (ASTM D2047): 1.0.

- e. Wet Static Coefficient of Friction (ASTM D2047): 0.9.
  - f. Dry Skid Resistance (ASTM E303): 89.
  - g. Wet Skid Resistance (ASTM E303): 57.
- B. Performance Requirements: Provide 2 layer rubber-urethane playground surfacing system which has been designed, manufactured and installed to meet the following criteria:
- 1. Shock Attenuation (ASTM F1292):
    - a. Gmax: Less than 200.
    - b. Head Injury Criteria: Less than 1000.
  - 2. Flammability (ASTM D2859): Pass.
  - 3. Tensile Strength (ASTM D412): 60 psi.
  - 4. Tear Resistance (ASTM D624): 140%.
  - 5. Water Permeability: 0.4 gal/yd<sup>2</sup>/second.
  - 6. Accessibility: Comply with requirements of ASTM F1951.

## 2.4 ORGANIC LOOSE-FILL SURFACING

- A. Use only where specifically indicated on Drawings.
- B. Engineered Wood Fiber: ASTM F 2075; containing no bark, leaves, twigs, or foreign or toxic materials; tested for accessibility according to ASTM F 1951.
  - 1. Critical Height: As indicated on Drawings and as required for selected equipment.
  - 2. Uncompressed Material Depth: Not less than as required for critical height indicated and as indicated on Drawings.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for subgrade and substrate conditions, for compliance with playground surface system manufacturer's requirements, and for other conditions affecting performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Stake locations of playground perimeter, playground equipment, use zones, and pathways. Clearly indicate locations of utilities, lawn sprinkler system, subgrade drainage systems, and underground structures.
- C. General: Prepare substrates to receive surfacing products according to playground surface system manufacturer's written instructions. Verify that substrates are sound and without high spots, ridges, holes, and depressions.
- D. Concrete and Asphalt Substrates: Provide sound surface free of laitance, efflorescence, curing compounds, and other contaminants incompatible with playground surface system.
  - 1. Repair unsatisfactory surfaces and fill holes and depressions.
  - 2. Mechanically scarify or otherwise prepare concrete substrates to achieve recommended degree of roughness.

3. Saw cut concrete or asphalt for terminal edges of playground surface systems as indicated.
4. Treat control joints and other nonmoving substrate cracks to prevent telegraphing through playground surface system.

### **3.2 GENERAL INSTALLATION REQUIREMENTS**

- A. General: Comply with playground surface system manufacturer's written installation instructions. Install playground surface system over area and in thickness indicated and as required to comply with specified requirements for impact-attenuation performance and, where indicated, for accessibility.

### **3.3 INSTALLATION OF PLAYGROUND SURFACING**

- A. Prepare subsurface in accordance with manufacturer's instructions to ensure proper support and drainage for playground safety surfacing tiles.
- B. Concrete Substrate:
  1. Concrete subsurface shall be as specified in Section 32 1313 "Cement Concrete Pavement".
  2. Apply light broom finish.
  3. Ensure concrete is sound with no loose material or cracks over 1/8 inch wide.
  4. Ensure concrete is a minimum of 28 days old.
  5. Test concrete for moisture in accordance with manufacturer's instructions to ensure it has sufficiently cured and is dry.
  6. Power wash existing concrete in accordance with manufacturer's instructions.
- C. Asphalt Substrate:
  1. Asphalt subsurface shall be as specified in Section 32 1216 "Hot Mix Asphalt Paving".
  2. Ensure asphalt is sound with no loose material or cracks over 1/8 inch wide
  3. Ensure asphalt is a minimum of 28 days old.
  4. Test asphalt for moisture in accordance with manufacturer's instructions to ensure it has sufficiently cured and is dry.
  5. Power wash existing asphalt in accordance with manufacturer's instructions.
- D. Variations in Elevation: Repair variations in elevation of completed subsurface greater than plus or minus 1/4 inch over 10 feet in any direction
- E. Installation:
  1. Install playground safety surfacing in accordance with manufacturer's instructions at locations indicated on the Drawings.
  2. Ensure prepared subsurface is dry and clean.
  3. Layout surface in accordance with manufacturer's instructions.
  4. Install surfacing in a single installation session.
  5. Layout in advance tiles to be installed in single installation session.
  6. Apply primer in accordance with manufacturer's instructions.

### **3.4 INSTALLATION OF PLAYGROUND SURFACING SYSTEM**

- A. Do not proceed with playground surfacing installation until all applicable site work, including substrate preparation, fencing, playground equipment installation and other relevant work, has been completed.

- B. Using a brush or short nap roller, apply primer to the substrate perimeter and any adjacent vertical barriers such as playground equipment support legs, curbs or slabs that will contact the surfacing system at the rate of 300 ft<sup>2</sup>/gallon.
- C. Basemat Installation:
  - 1. Using screeds and hand trowels, install the basemat at a consistent density of 29 pounds, 1 ounce per cubic foot to the specified thickness.
  - 2. Allow basemat to cure for sufficient time so that indentations are not left in the basemat from applicator foot traffic or equipment.
  - 3. Do not allow foot traffic or use of the basemat surface until it is sufficiently cured.
- D. Primer Application: Using a brush or short nap roller, apply primer to the basemat perimeter and any adjacent vertical barriers such as playground equipment support legs, curbs or slabs that will contact the surfacing system at the rate of 300 ft<sup>2</sup>/gallon.
- E. Top Surface Installation:
  - 1. Using a hand trowel, install top surface at a consistent density of 58 pounds, 9 ounces per cubic foot to a nominal thickness of 1/2 inch
  - 2. Allow top surface to cure for a minimum of 48 hours.
  - 3. At the end of the minimum curing period, verify that the top surface is sufficiently dry and firm to allow foot traffic and use without damage to the surface.
  - 4. Do not allow foot traffic or use of the surface until it is sufficiently cured.

### **3.5 INSTALLATION OF LOOSE-FILL SURFACING**

- A. Apply components of loose-fill surfacing according to manufacturer's written instructions to produce a uniform surface.
- B. Loose Fill: Place loose-fill materials to required depth after installation of playground equipment support posts and foundations. Include manufacturer's recommended amount of additional material to offset natural compaction over time.
- C. Grading: Uniformly grade loose fill to an even surface free from irregularities.
- D. Finish Grading: Hand rake to a uniformly smooth finished surface and to required elevations.

### **3.6 FIELD QUALITY CONTROL**

- A. After-Installation Inspection:
  - 1. Provide third-party inspection of playground safety surfacing within 30 days of installation.
  - 2. Conduct inspection by National Recreation and Parks Association/National Playground Safety Institute (NRPA/NPSI) Certified Playground Safety Inspector (CPSI).
  - 3. Determine compliance with ASTM F 1292, unless otherwise specified in this section.

### **3.7 PROTECTION**

- A. Protect playground safety surfacing from foot traffic for a minimum of 12 hours after installation.
- B. Protect completed surfacing from damage during construction.

**END OF SECTION**



## SECTION 32 3113

### CHAIN LINK FENCES AND GATES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Galvanized-steel chain link fabric.
  - 2. Galvanized-steel framework.
- B. Related Sections:
  - 1. Section 05 5000 "Metal Fabrications" for bollards, posts and chains not part of chain link fence systems.
  - 2. Section 31 2316 "Excavation" for filling and grading work.

##### 1.3 SUBMITTALS

- A. Product Data: Provide product data in the form of manufacturer's technical data, specifications, and installation instructions for fence and gate posts, fabric, gates, and accessories.
- B. Shop Drawings: Provide shop drawings showing location of fence, gates, each post, and details of post installation, extension arms, gate swing, hardware, and accessories.

##### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has at least three years' experience and has completed at least five chain link fence projects with same material and of similar scope to that indicated for this Project with a successful construction record of in-service performance.
- B. Single-Source Responsibility: Obtain chain link fences and gates, including accessories, fittings, and fastenings, from a single source.

##### 1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify layout information for fences and gates shown on the Drawings in relation to the property survey and existing structures. Verify dimensions by field measurements.

## PART 2 - PRODUCTS

### 2.1 FABRIC

- A. Selvage: Knuckled on both selvages for 2-inch and 2-1/8-inch mesh sizes with heights of 60 inches and less.
- B. Selvage: Knuckled at one selvage and twisted at the other for 2-inch and 2-1/8-inch mesh sizes and heights above 60 inches.
- C. Steel Chain-Link Fence Fabric: Fabricated in one-piece widths for fencing 12 feet and less in height to comply with Chain Link Fence Manufacturers Institute (CLFMI) "Product Manual" and with requirements indicated below:
  - 1. Mesh and Wire Size: 2-inch mesh, 0.148-inch diameter (9 gage).
  - 2. Coating: ASTM A 817, Type 2, Class 2, zinc-coated (galvanized).

### 2.2 FRAMING

- A. Round member sizes are given in actual outside diameter (OD) to the nearest thousandth of inches. Round fence posts and rails are often referred to in ASTM standard specifications by nominal pipe sizes (NPS) or the equivalent trade sizes in inches. The following indicates these equivalents all measured in inches:

| Actual OD | NPS Size | Trade Size |
|-----------|----------|------------|
| 1.315     | 1        | 1-3/8      |
| 1.660     | 1-1/4    | 1-5/8      |
| 1.900     | 1-1/2    | 2          |
| 2.375     | 2        | 2-1/2      |
| 2.875     | 2-1/2    | 3          |
| 3.500     | 3        | 3-1/2      |
| 4.000     | 3-1/2    | 4          |
| 6.625     | 6        | 6-5/8      |
| 8.625     | 8        | 8-5/8      |

- B. Type I Round Posts: Standard weight (schedule 40) galvanized-steel pipe conforming to ASTM F 1083, according to heavy industrial requirements of ASTM F 669, Group IA, with minimum yield strength of 25,000 psi, not less than 1.8 oz. of zinc per sq. ft. Type A coating inside and outside according to ASTM F 1234, as determined by ASTM A 90, and weights per foot as follows:

| Actual OD | Weight (lb/ft) | NPS Size |
|-----------|----------------|----------|
| 1.315     | 1.68           | 1        |
| 1.660     | 2.27           | 1-1/4    |
| 1.900     | 2.72           | 1-1/2    |
| 2.375     | 3.65           | 2        |
| 2.875     | 5.79           | 2-1/2    |
| 3.500     | 7.58           | 3        |
| 4.000     | 9.11           | 3-1/2    |
| 6.625     | 8.97           | 6        |
| 8.625     | 28.55          | 8        |

- C. Top Rail: Manufacturer's longest lengths (17 to 21 feet) with swaged-end or expansion-type coupling, approximately 6 inches long for joining. Provide rail ends or other means for attaching top rail securely to each gate corner, pull, and end post.
  - 1. Round Steel: 1.660-inch OD Type I or II steel pipe.

- D. Steel posts for fabric heights up to 6 feet:
  - 1. Round Line or Intermediate Posts: 1.90-inch OD Type I or II steel pipe.
  - 2. Round End, Corner, and Pull Posts: 2.375-inch OD Type I or II steel pipe.
- E. Steel posts for fabric heights over 6 feet:
  - 1. Round Line or Intermediate Posts: 2.375-inch OD Type I or II steel pipe.
  - 2. Round End, Corner, and Pull Posts: 2.875-inch OD Type I or II steel pipe.
- F. Swing Gate Posts: Furnish posts to support single gate leaf, or one leaf of a double-gate installation, according to ASTM F 900, sized as follows for steel and aluminum pipe posts:
  - 1. Steel posts for fabric height of 6 feet or less and gate leaf width:
    - a. Up to and including 4 Feet: 2.375-inch OD pipe weighing at least 3.11 lb per ft.
    - b. Over 4 to 10 Feet: 2.875-inch OD pipe weighing at least 4.64 lb per ft.
    - c. Over 10 to 18 Feet: 4.000-inch OD pipe weighing at least 8.65 lb per ft.
  - 2. Steel posts for fabric height over 6 feet and gate leaf width:
    - a. Up to and including 6 Feet: 2.875-inch OD pipe weighing at least 4.64 lb per ft.
    - b. Over 6 to 12 Feet: 4.000-inch OD pipe weighing at least 8.65 lb per ft.
    - c. Over 12 to 18 Feet: 6.625-inch OD pipe weighing at least 10.02 lb per ft.
    - d. Over 18 to 24 Feet: 8.625 OD pipe weighing at least 27.12 lb per ft.

## 2.3 FITTINGS AND ACCESSORIES

- A. Material: Comply with ASTM F 626. Mill-finished aluminum or galvanized iron or steel to suit manufacturer's standards.
  - 1. Steel and Iron: Unless specified otherwise, hot-dip galvanize pressed steel or cast-iron fence fittings and accessories with at least 1.2 oz. zinc per sq. ft. as determined by ASTM A 90.
- B. Post and Line Caps: Provide weathertight closure cap for each post. Provide line post caps with loop to receive tension wire or top rail.
- C. Post Brace Assembly: Manufacturer's standard adjustable brace. Use material specified below for brace, and truss to line posts with 3/8-inch-diameter rod and adjustable tightener. Provide manufacturer's standard galvanized-steel, cast-iron or cast-aluminum cap for each end.
  - 1. Round Steel: 1.660-inch OD Type I or II steel pipe.
- D. Tension or Stretcher Bars: Hot-dip galvanized steel with a minimum length 2 inches less than the full height of fabric, a minimum cross section of 3/16 inch by 3/4 inch, and a minimum of 1.2 oz. of zinc coating per sq. ft. Provide one bar for each gate and end post, and two for each corner and pull post, except where fabric is integrally woven into the post.
- E. Tension and Brace Bands: 3/4-inch-wide minimum hot-dip galvanized steel with a minimum of 1.2 oz. of zinc coating per sq. ft.
  - 1. Tension Bands: 0.074 inch thick (14 gage) minimum.
  - 2. Brace Bands: 0.105 inch thick (12 gage) minimum.
- F. Tension Wire: 0.177-inch-diameter metallic-coated steel marcelled tension wire conforming to ASTM A 824 with finish to match fabric.
  - 1. Coating Type II zinc in the following class as determined by ASTM A 90.
    - a. Class 2, with a minimum coating weight of 1.20 oz. per sq. ft. of uncoated wire surface.

- G. Tie Wires: 0.106-inch-diameter (12-gage) galvanized steel with a minimum of 0.80 oz. per sq. ft. of zinc coating according to ASTM A 641, Class 3 or 0.148-inch-diameter (9-gage) aluminum wire alloy 1350-H19 or equal, to match fabric wire.

## 2.4 CONCRETE

- A. Concrete: Provide concrete consisting of Portland cement per ASTM C 150, aggregates per ASTM C 33, and potable water. Mix materials to obtain concrete with a minimum 28-day compressive strength of 3000 psi. Use at least four sacks of cement per cu. yd., 1-inch maximum size aggregate, 3-inch maximum slump.

## 2.5 GATES

- A. General: Fabricate perimeter frames of gates from same material and finish as fence framework. Assemble gate frames by welding. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware, and accessories. Space frame members maximum of 8 feet apart unless otherwise indicated.
1. Fabric: Same as for fence unless otherwise indicated. Secure fabric at vertical edges with tension bars and bands and to top and bottom of frame with tie wires.
  2. Bracing: Install diagonal cross-bracing consisting of 5/16-inch-diameter adjustable-length truss rods on gates to ensure frame rigidity without sag or twist.
- B. Swing Gates: Comply with ASTM F 900.
1. Steel: Gates up to 8 feet wide:
    - a. Up to 6 Feet High: Fabricate perimeter frames of 1.660-inch minimum OD Type I or II steel pipe or 1-1/2-inch-square galvanized-steel tubing weighing 1.84 lb per sq. ft.
    - b. Over 6 Feet High: Fabricate perimeter frames of 1.90-inch minimum OD Type I or II steel pipe or 2-inch-square galvanized-steel tubing weighing 2.52 lb per sq. ft.
  2. Gate Hardware: Provide galvanized hardware and accessories for each gate according to the following:
    - a. Hinges: Size and material to suit gate size, non-lift-off type, offset to permit 180-degree gate opening. Provide 1-1/2 pair of hinges for each leaf over 6-foot nominal height.
    - b. Latch: Forked type or plunger-bar type to permit operation from either side of gate, with locking hasp for padlock as an integral part of latch. At fire access gate, provide knock box for emergency services access; coordinate keying with local fire department and other authorities having jurisdiction.
    - c. Keeper: Provide a keeper for vehicle gates that automatically engages gate leaf and holds it in the open position until manually released.
      - 1) Supplier: Mountain States Fence, 3737 South 500 West, SLC, Utah 84155
      - 2) Product: 'Gate Keeper' # 6715 or Architect approved equivalent.
    - e. Gate Stops: Provide gate stops for double gates consisting of mushroom-type flush plate with anchors, set in concrete, and designed to engage a center drop rod or plunger bar. Include a locking device and padlock eyes as an integral part of the latch, permitting both gate leaves to be locked with a single padlock.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Install fence to comply with ASTM F 567. Do not begin installation and erection before final grading is completed, unless otherwise permitted.
  - 1. Apply fabric to outside of framework. Install fencing on boundary lines inside of property line established by survey as required by Division 1.
  
- B. Excavation: Drill or hand-excavate (using post-hole digger) holes for posts to diameters and spacings indicated, in firm, undisturbed or compacted soil.
  - 1. If not indicated on Drawings, excavate holes for each post to minimum diameter recommended by fence manufacturer, but not less than four times the largest cross section of post.
  - 2. Unless otherwise indicated, excavate hole depths approximately 3 inches lower than post bottom, with bottom of posts set not less than 36 inches below finish grade surface.
  
- C. Setting Posts: Center and align posts in holes 3 inches above bottom of excavation. Space a maximum of 10 feet o.c., unless otherwise indicated.
  - 1. Protect portion of posts above ground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.
    - a. Unless otherwise indicated, extend concrete footings 2 inches above grade and trowel to a crown to shed water.
  
- D. Top Rails: Run rail continuously through line post caps, bending to radius for curved runs and at other posts terminating into rail end attached to posts or post caps fabricated to receive rail. Provide expansion couplings as recommended by fencing manufacturer.
  
- E. Brace Assemblies: Install braces at end and gate posts and at both sides of corner and pull posts. Locate horizontal braces at midheight of fabric on fences with top rail and at two thirds fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.
  
- F. Bottom Tension Wire: Install tension wire within 6 inches of bottom of fabric before stretching fabric and tie to each post with not less than same gage and type of wire. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch-diameter (11-gage) hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c.
  
- G. Fabric: Leave approximately 2 inches between finish grade and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence, and anchor to framework so that fabric remains under tension after pulling force is released.
  
- H. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not over 15 inches o.c.
  
- I. Tie Wires: Use wire of proper length to secure fabric firmly to posts and rails. Bend ends of wire to minimize hazard to persons or clothing.
  - 1. Maximum Spacing: Tie fabric to line posts 12 inches o.c. and to rails and braces 24 inches o.c.

- J. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts for added security.

### **3.2 GATE INSTALLATION**

- A. Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary. Install gates according to manufacturer's instructions.

### **3.3 ADJUSTING**

- A. Gates: After repeated operation of completed installation equivalent to 3 days' use by normal traffic, readjust gates for optimum operating condition and safety. Lubricate operating equipment and clean exposed surfaces.

**END OF SECTION**

## SECTION 32 3119

### DECORATIVE IRON FENCING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Steel picket fencing.
  - 2. Swing gates.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 03 3000 "Cast-in-Place Concrete" for concrete for post footings and mow strips.
  - 2. Section 31 3216 "Excavation" for filling and grading work.

##### 1.3 SUBMITTALS

- A. Shop drawings showing location of fence, each post, and details of post installation, hardware, and accessories.

##### 1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in successfully producing decorative fences similar to that indicated for this Project and with sufficient production capacity to produce required units without delaying the Work.
- B. Installer Qualifications: Arrange for installation of decorative fences specified in this Section by the same firm that fabricated it.
- C. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code-Steel".
  - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

##### 1.5 WARRANTY

- A. All structural fence components (i.e. rails, pickets, and posts) shall be warranted within specified limitations, by the manufacturer for a period of 20 years from date of original purchase. Warranty shall cover any defects in material finish, including cracking, peeling, chipping, blistering or corroding.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements of Contract Documents, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Ameristar; Montage II Welded and Rackable Ornamental Steel; "Majestic" style (closed top).
  2. The Fortress Company; FT2 Titan Light Industrial.
- B. Size: 6 feet at Pre-K and Kindergarten play area, 4 feet elsewhere and as indicated on Drawings.

### 2.2 METALS

- A. General: Provide metals free from surface blemishes where exposed to view in the finished unit. Exposed-to-view surfaces exhibiting pitting, seam marks, roller marks, stains, discolorations, or other imperfections on finished units are not acceptable.
- B. Steel material for fence framework (i.e., tubular pickets, rails, and posts), when galvanized prior to forming, shall conform to the requirements of ASTM A924, with a minimum yield strength of 50,000 psi. The steel shall be hot-dip galvanized to meet the requirements of ASTM A653/A653M with a minimum zinc coating weight of 0.90 oz/ft<sup>2</sup>, Coating Designation G-90.
- C. Finish manufactured galvanized framework with a thermal stratification coating process (high-temperature, in-line, multi-stage, multi-layer) including, as a minimum, a six-stage pretreatment/wash (with zinc phosphate), an electrostatic spray application of an epoxy base, and a separate electrostatic spray application of a polyester finish.
1. Base Coat: Zinc-rich thermosetting epoxy powder coating (gray)
  2. Topcoat: Acrylic finish with a minimum combined epoxy and acrylic thickness of 2 mils. The color shall be as selected by the Architect from the manufacturer's full range of available colors.
  3. Framework shall be capable of meeting the performance requirements for each quality characteristic shown below:

| Quality Characteristics | ASTM Test Method              | Performance Requirements  |
|-------------------------|-------------------------------|---|
| Adhesion                | D3359 Method B                | Adhesion (Retention of Coating) over 90% of test area (Tape and knife test)   |
| Corrosion Resistance    | B117 & D1654                  | Corrosion Resistance over 3,500 hours (Scribed per D1654; failure mode is accumulation of 1/8 in. coating loss from scribe or medium #8 blisters) |
| Impact Resistance       | D2794                         | Impact Resistance over 60 inch lb. (Forward impact using 0.625 inch ball)   |
| Weathering Resistance   | D822, D2244, D523 (60 Method) | Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units)                   |



- D. Material for fence pickets shall be 1 inch square x 14 gauge tubing. .
1. Rails: Outside cross-section dimensions of 1.75 inch square and a minimum thickness of 0.105 inch.
  2. Space picket holes in rail 4.715 inches on center.
  3. Picket retaining rods shall be 0.125 inch diameter galvanized steel.
  4. Posts shall be a minimum of 2-1/2 inch square x 12 gage.
  5. Supply PVC grommets to seal picket-to-rail intersections.
  6. Cap pickets at top and bottom with the manufacturer's standard PVC or metal caps to prevent insects from nesting in pickets.
- E. Fabricate gates using panel material and gate ends having the same outside cross-section dimensions as the fence rail. Join rail and upright intersections shall by welding. Join picket and rail intersections either by welding or by the same retaining rod process used for panel assembly.

### 2.3 MISCELLANEOUS MATERIALS

- A. Welding Electrodes and Filler Metal: Type and alloy of filler metal and electrodes as recommended by producer of metal to be welded, complying with applicable AWS specifications, and as required for color match, strength, and compatibility in the fabricated items.
- B. Fasteners: Use fasteners of same basic metal as the fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.
1. Provide concealed fasteners for interconnection of ornamental metalwork components and for their attachment to other work except where exposed fasteners are unavoidable or are the standard fastening method.
- C. Cast-in-Place and Post-Installed Anchors: Anchors of type indicated below, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
1. Expansion anchors.
- D. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, non-staining, noncorrosive, non-gaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- E. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements of FS TT-P-664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- F. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, complying with DOD-P-21035 or SSPC-paint 20.
- G. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

## 2.4 FITTINGS AND ACCESSORIES

- A. Material: Comply with ASTM F 626. Mill-finished aluminum or galvanized iron or steel to suit manufacturer's standards.
  - 1. Steel and Iron: Unless specified otherwise, hot-dip galvanize pressed steel or cast-iron fence fittings and accessories with at least 1.2 oz. zinc per sq. ft. as determined by ASTM A 90.
  - 2. Post and Line Caps: Provide weathertight closure cap for each post.

## 2.5 GATE HARDWARE

- A. Gate Hardware: Provide hardware and accessories for each gate according to the following. Finishes to match fencing.
  - 1. Hinges: Size and material to suit gate size, non-lift-off type, offset to permit 180-degree gate opening. Provide 1-1/2 pair of hinges for each leaf over 6-foot nominal height. Hinges shall be self-closing type, designed to keep gate in closed position.
  - 2. Gate Stops: Provide gate stops for double gates consisting of mushroom-type flush plate with anchors, set in concrete, and designed to engage a center drop rod or plunger bar.
  - 3. Panic Hardware: Weather-resistant alarmed exit bar and receiver box/strike with safety shield/mounting plate to prevent access from pull side of gate. Provide lock box for external access; key to Owner's system.

## 2.6 CONCRETE

- A. Concrete: Provide concrete consisting of Portland cement per ASTM C 150, aggregates per ASTM C 33, and potable water. Mix materials to obtain concrete with a minimum 28-day compressive strength of 3000 psi. Use at least four sacks of cement per cu. yd., 1-inch maximum size aggregate, 3-inch maximum slump.

## 2.7 FABRICATION

- A. Form decorative fences to required shapes and sizes, with true curves, lines, and angles. Provide components to sizes and profiles indicated, but not less than required to comply with requirements indicated for structural performance.
- B. Provide necessary rebates, lugs, and brackets to assemble units and to attach to other work. Drill and tap for required fasteners, unless otherwise indicated. Use concealed fasteners wherever possible.
- C. Comply with AWS for recommended practices in shop welding and brazing. Provide welds and brazes behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded and brazed joints of all flux, and dress all exposed and contact surfaces.
- D. Mill joints to a tight, hairline fit. Cope or miter corner joints. Form joints exposed to weather to exclude water penetration.
- E. Provide castings that are sound and free of warp, cracks, blow holes, or other defects that impair strength or appearance. Grind, wire brush, sandblast, and buff castings to remove seams, gatemarks, casting flash, and other casting marks.
- F. Finish exposed surfaces to smooth, sharp, well-defined lines and arises.

- G. Assemble items in the shop to the greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- H. Welded Connections: Fabricate handrails and railing systems of materials indicated below to interconnect members by welding. Use welding method that is appropriate for metal and finish indicated and that develops strength required to comply with structural performance criteria. Finish exposed welds and surfaces smooth, flush and blended to match adjoining surfaces.
- I. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing members to other work, unless otherwise indicated.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Coordinate and furnish anchorages and setting drawings, diagrams, templates, instructions, and directions for installing items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to the project site.

### **3.2 INSTALLATION**

- A. Provide anchorage devices and fasteners where necessary for securing decorative fences to in-place construction.
- B. Perform cutting, drilling, and fitting required to install decorative fencing. Set products accurately in location, alignment, and elevation, plumb, level and true, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- C. Fit exposed connections accurately together to form tight, hairline joints or, where indicated, with uniform reveals and spaces for sealants and joint fillers. Where cutting, welding, and grinding are required for proper shop fitting and jointing of fence sections, restore finishes to eliminate any evidence of such corrective work.
- D. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.
- E. Restore protective coverings that have been damaged during shipment or installation. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at the same location.
- F. Field Welding: Comply with the applicable AWS specification for procedures of manual shielded metal-arc welding, for appearance and quality of welds made, and for methods used in correcting welding work. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Grind exposed welded joints smooth and restore finish to match finish of adjacent surfaces.

### **3.3 ADJUSTING**

- A. Touch-up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material.
- B. For galvanized surfaces, clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

### **3.4 PROTECTION**

- A. Protect finishes of decorative fences from damage during construction period with temporary protective coverings approved by fence fabricator. Remove protective covering at the time of Substantial Completion.
  - 1. Restore finishes damaged during installation and construction so that no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinished entire unit; or provide new units as required.

**END OF SECTION**

## SECTION 32 3300

### SITE FURNISHINGS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes the following site and street furnishings:
  - 1. Benches.
  - 2. Trash Receptacles
- B. Related Sections include the following:
  - 1. Section 31 2316 "Excavation" for excavation for installation of concrete footings.
  - 2. Section 03 3000 "Cast-in-Place Concrete" for installation of pipe sleeves cast in concrete footings.
- C. Products furnished, but not installed under this Section, include pipe sleeves to be cast in concrete footings.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, field-assembly requirements, and installation details.
- B. Samples for Selection: For units with factory-applied color finishes.
- C. Maintenance Data: For site and street furnishings to include in maintenance manuals.

##### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of site and street furnishings through one source from a single manufacturer.

#### PART 2 - PRODUCTS

##### 2.1 MANUFACTURERS

- A. Benches - Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
  - 1. Manufacturer: Smith Steel Works; smithsteelworks.com
  - 2. Product: Classic Bench 6 feet long.

- B. Trash Receptacles - Basis of Design: Contract Documents are based on products specified below to establish a standard of quality. Other manufacturers with products having equivalent characteristics may be considered, provided deviations are minor and design concept as expressed in the Contract Documents is not changed, as judged by the Architect.
1. Manufacturer: Global Industrial; globalindustrial.com
  2. Product: Outdoor Steel Diamond Trash Can with Domed Lid; #WB261948 BK

## 2.2 MATERIALS

- A. Steel: Free from surface blemishes and complying with the following:
1. Plates, Shapes, and Bars: ASTM A 36.
  2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53, or electric-resistance-welded pipe complying with ASTM A 135.
  3. Tubing: Cold-formed steel tubing complying with ASTM A 500.
  4. Sheet: Commercial steel sheet complying with ASTM A 569.
  5. Perforated Metal: From steel sheet not less than 0.1196-inch nominal thickness; manufacturer's standard perforation pattern.
- B. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials; commercial quality; tamperproof, vandal and theft resistant; concealed, recessed, and capped or plugged. Provide as required for site and street furnishings' assembly, mounting, and secure attachment.
- C. Non-shrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.
- D. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:
1. Zinc-Coated Tubing: External, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. of zinc after welding, a chromate conversion coating, and a clear, polymer film. Internal, same as external or consisting of 81 percent, not less than 0.3-mil- thick, zinc pigmented coating.
  2. Hot-Dip Galvanizing: According to ASTM A 123, ASTM A 153, or ASTM A 924.
- E. Finish: Powder coat with sandblast, epoxy prime 2-4 mils, final TGIC UV resistant coating at 2-4 mils. Color: As selected by Architect from manufacturer's full range.
- F. Bench Material:
1. Laser cut from single sheet of steel; powder coated.
  2. Color: As selected by Architect from manufacturer's full range.

## 2.3 BENCHES

- A. Dimensions: 72 inches L x 27 inches D x 38 inches H.
- B. Locations as shown on Drawings.

## 2.4 TRASH RECEPTACLES

- A. Characteristics:
  - 1. Frame: 1/8 inch thick, 11 gage steel.
  - 2. Mesh: 3/4 inch openings.
  - 3. Self-closing swing action door on dome lid.
  - 4. Liner: Plastic
  - 4. Size: 23-1/2 inches x 40 inches H.
  - 5. Finish:
    - a. Frame: thermoplastic-coated
    - b. Powder coat.
- B. Locations: As indicated on Drawings but at least one at each building entry.

## 2.5 FABRICATION

- A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.
- B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.
- C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- D. Steel and Iron Components: Galvanized, galvanized and color coated, or color coated. Bare metal steel or iron components are not permitted.
- E. Exposed Surfaces: Polished, sanded, or otherwise finished; smooth all surfaces, free from burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.
- F. Factory Assembly: Assemble components in the factory to the greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

## 2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## **2.8 STEEL AND GALVANIZED STEEL FINISHES**

- A. Powder Coat Finish: Manufacturer's standard, UV-light stabilized finish; complying with coating manufacturer's written instructions for pretreatment, application, and minimum dry film thickness.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION, GENERAL**

- A. Comply with manufacturer's written installation instructions, unless more stringent requirements are indicated. Complete field assembly of site and street furnishings, where required.
- B. Unless otherwise indicated, install site and street furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.
- D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
- E. Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

### **3.3 CLEANING**

- A. After completing site furnishing installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

**END OF SECTION**



## SECTION 32 7000

### GENERAL LANDSCAPE SITE WORK REQUIREMENTS

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Includes But Not Limited To
  - 1. General procedures and requirements for Site Work.

#### PART 2 PRODUCTS - Not Used

#### PART 3 EXECUTION

##### 3.1 EXAMINATION

- A. Site Verification Of Conditions
  - 1. 48 hours minimum prior to performing any work on site, contact USA (Underground Service Alert) to arrange for utility location services.
  - 2. Pothole to verify location of existing various underground facilities at sufficient locations to assure that no conflict with the proposed work exists and sufficient clearance is available to avoid damage to existing facilities.
  - 3. Perform potholing at least 10 working days in advance of performing any excavation or underground work.
  - 4. Upon discovery of conflicts or problems with existing facilities, notify Architect by phone or email within 24 hours. Include in the email a narrative and diagrams indicating the conflict or problem and sufficient measurements and details to evaluate the problem.

##### 3.2 PREPARATION

- A. Protection
  - 1. Spillage -
    - a. Avoid spillage by covering and securing loads when hauling on or adjacent to public streets or highways.
    - b. Remove spillage and sweep, wash, or otherwise clean project, streets, and highways.
  - 2. Dust Control -
    - a. Take precautions necessary to prevent dust nuisance, both on-site and adjacent to public and private properties.
    - b. Correct or repair damage caused by dust.
  - 3. Erosion Control -
    - a. Take precautions necessary to prevent erosion and transportation of soil downstream, to adjacent properties, and into on-site or off-site drainage systems.
    - b. Develop, install, and maintain an erosion control plan if required by law.
    - c. Repair and correct damage caused by erosion.
  - 4. Existing Plants & Features - Do not damage tops, trunks, and roots of existing trees and shrubs, on or off site, which are intended to remain. Do not use heavy equipment within branch spread. Interfering branches may be removed only with permission of Architect. Do not damage other plants and features which are to remain.
- B. If specified precautions are not taken or corrections and repairs made promptly, Owner may take such steps as may be deemed necessary and deduct costs of such from monies due

to Contractor. Such action or lack of action on Owner's part does not relieve Contractor from responsibility for proper protection of the Work.

### **3.3 FIELD QUALITY CONTROL**

- A. If work has been interrupted by weather, scheduling, or other reason, notify Architect 24 hours minimum prior to intended resumption of grading or compacting.
- B. Owner reserves right to require additional testing to re-affirm suitability of completed work including compacted soils which have been exposed to adverse weather conditions.

**END OF SECTION**

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**SECTION 32 8423**

**UNDERGROUND SPRINKLERS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install planting irrigation system as described in Contract Documents complete with accessories necessary for proper function.
- B. Related Requirements:
  - 1. Section 32 7000 – General Landscape Site Work Requirements

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Pre-Installation Conference: Refer to paragraph B.
  - 2. Substantial Completion Walkthrough: With Landscape Architect, plan and provide walk through after completion of irrigation system.
  - 3. Irrigation Final Acceptance: With Landscape Architect, plan and provide final walk through after completion of all work listed on Substantial Completion walk through list provided by Landscape Architect.
- B. Pre-Installation Conference:
  - 1. Participate in mandatory pre-installation conference:
    - a. Irrigation Subcontractor’s Representative and Foreman responsible for installation of irrigation system required to be in attendance.
  - 2. Schedule pre-installation conference before irrigation system installation begins.
  - 3. In addition to agenda items specified in Section 01 3100, review the following:
    - a. Landscape Architect or designated Representative will demonstrate or describe method to be used to maintain head spacing from concrete and to stabilize heads.
    - b. Within project site, provide one (1) installed example of each type of irrigation detail for review and approval by Landscape Architect and Owner prior to beginning site work.
    - c. Review required tests and inspections.
    - d. Review Controller requirements.

- C. Sequencing:
  - 1. Install sleeves before installation of cast-in-place concrete site elements and paving.

### **1.3 SUBMITTALS**

- A. Product Data:
  - 1. Manufacturers cut sheets for each element of the system.
- B. Informational Submittals:
  - 1. Test And Evaluation Reports:

- a. Results of main line service pressure test before beginning work on system should be submitted as a report following testing and before burial of mainline.
- C. Manufacturer Instructions:
  - 1. Manufacturer's printed literature on operation and maintenance of operating elements of system.
  - 2. Instruction Manual:
    - a. Includes complete directions for system operation and maintenance, including winterizing, controller program worksheet and annual service and scheduling calendar based on local site specific conditions.
  - 3. Complete instructions on how to drain entire main filter.
- D. Qualification Submittals:
  - 1. Irrigation Subcontractor:
    - a. Minimum five (5) years experience in irrigation installations.
    - b. Minimum five (5) satisfactorily completed irrigation installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.
    - c. Produce certifiable list of reputable landscape suppliers from whom it will be purchasing materials to be used on this project.
    - d. Produce evidence that it employs quality employees with specified experience and in a quantity sufficient to perform work of this Section within time limits established by Contractor.
    - e. Produce evidence that all employees have legal documents to be working in the United States and that documents have been verified legitimate by the owner.
    - f. Agree to complete reporting documents, including:
      - 1) Use only certified installers for controller technology.
      - 2) Use only approved Distributors for controller system.
      - 3) Provide Controller Instructional Training Document.
      - 4) If Leemco products are used provide Certification from Leemco or distributor that all laborers have been trained on the installation of all Leemco components.
      - 5) Assist Landscape Architect in completing the Watering Schedule.
  - 2. Irrigation Installer:
    - a. Irrigation installation shall be performed under direction of foreman or supervisor with minimum five (5) years experience in irrigation sprinkler installations similar in size, scope, and complexity. Contractor to provide the name of the foreman, a list of at least 5 similar jobs and 5 references.
    - b. Foreman or supervisor required to attend pre-installation conference.
    - c. Use trained personnel familiar with required irrigation installation procedures and with Contract Documents.
- E. Closeout Submittals:
  - 1. Record Drawings:
    - a. As installation occurs, prepare accurate record drawing to be submitted before final inspection, including:
      - 1) Detail and dimension changes made during construction.
      - 2) Significant details and dimensions not shown in original Contract Documents.
      - 3) Field dimensioned locations of all mainlines, valve boxes, manual drains, quick-coupler valves, control wire runs not in mainline ditch, and both ends of sleeves.
      - 4) Take dimensions from permanent constructed surfaces or edges located at or above finish grade.
      - 5) Take and record dimensions at time of installation.
      - 6) Number of heads per zone.
      - 7) Separate drawing showing irrigation schedule.
      - 8) Ohms reading report for grounding at controller and each grounding device in system.

- b. Reduce copy of record drawing to *half size*, color key circuits, and laminate both sides with 5 mil thick or heavier plastic. Provide 2 additional, non-mounted, full size copies: 1-nonlaminated and 1-laminated.
  - 2. Operations and Maintenance Manual Data:
    - a. Include in the Maintenance Manual the following information:
      - 1) Instruction manual that contains complete directions for system operation and maintenance, including winterizing, controller program worksheet and annual service and scheduling calendar based on local site specific conditions.
      - 2) Complete instructions on how to drain entire main filter.
      - 3) Complete instructions on how to drain and service filter.
      - 4) Manufacturer's cut sheets for each element of system.
      - 5) Parts lists for operating elements of system.
      - 6) Manufacturer's printed literature on operation and maintenance of operating elements of system.
  - 3. Warranty Documentation:
    - a. Manufacturer's warranty information for each operating elements of system.
  - 4. Photographs: Provide photographs prior to burial of key elements including but not limited to:
    - a. Valves.
    - b. Drains.
    - c. Master valves and flow sensors.
  - 5. Final payment for system will not be authorized until Closeout Submittals are received and accepted by Architect and landscape consultant.
- F. Maintenance Material Submittals:
  - 1. Extra Components to Owner:
    - a. Contractor to provide the following materials prior to the final inspection:
      - 1) 5 Rotor heads (each type) and nozzles as specified in the play fields.
      - 2) 1 Control Valve of each type and size specified on plans.
      - 3) 1 Drip Control Zone Kit
      - 4) 1 bag for each size of emitters specified on plans.
  - 2. Tools:
    - a. Furnish following items before Final Closeout Review:
      - 1) One heavy-duty key for stop and waste or main shut-off valve.
      - 2) One heavy duty Square nut key for isolation valves.
      - 3) One quick coupler key with brass hose swivel for each point of connection.
      - 4) Keys to the controller closets. 1 set for each controller.

#### 1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
  - 1. Work and materials shall be in accordance with latest rules and regulations, and other applicable state or local laws.
  - 2. Nothing in Contract Documents is to be construed to permit work not conforming to these codes.
- B. Qualifications:
  - 1. Installers:
    - a. Use trained factory certified personnel familiar with required irrigation system and controller installation procedures. Follow requirements shown in PART 3 Execution 3.1 Installers.
    - b. Perform installation under direction of foreman or supervisor with five years minimum experience in sprinkling system installations.
    - c. Controller:

- 1) Factory trained certified personnel familiar with required irrigation system and SMART RAIN controller installation procedures. Follow requirements as described under Installers in PART 3 EXECUTION.

C. Mockups:

1. Provide Mock-Ups of each detail within valve box at staging area for review by Landscape Architect prior to installation of irrigation system.
2. These mock-ups may be installed with or without solvent weld cement so that they can later be used in field.
3. Mock-ups shall include complete installation included filter fabric, gravel sump, equipment assembly, valve box placement and branding in conformance with these specifications.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. During delivery, installation, and storage, protect materials from damage and prolonged exposure to sunlight.

## 1.6 SEQUENCING

- A. Install sleeves prior to installation of cast-in-place concrete site elements and paving.

## 1.7 WARRANTY

- A. Standard TWO-YEAR guarantee shall include replacement of defective parts and workmanship. Guarantee shall also include the following:
1. Repairing or replacing defective materials or workmanship.
  2. Filling and repairing depressions and replacing plantings due to settlement of irrigation system trenches.
  3. Adjust elevation of heads.
  4. Adjusting system to supply proper coverage of areas to receive water.
  5. Ensuring system can be adequately drained.

## PART 2 - PRODUCTS

### 2.1 SYSTEM

- A. Manufacturers:
1. Manufacturer Contact List (for reference only):
    - a. Action Machining Inc, Bountiful, UT [www.actionfilters.com](http://www.actionfilters.com).
    - b. Amiad Water Systems, Oxnard, CA [www.amiad.com](http://www.amiad.com)
    - c. Apollo Valves by Conbraco Industries, Matthews, NC [www.apollovalves.com](http://www.apollovalves.com)
    - d. Carson Industries LLC, Glendora, CA [www.carsonind.com](http://www.carsonind.com)
    - e. Hunter Industries, San Marcos, CA [www.hunterindustries.com](http://www.hunterindustries.com)
    - f. Smart Rain Systems LLC, Bountiful, UT [www.smartrain.net](http://www.smartrain.net)
    - g. IPS Corporation, Compton, CA [www.ipscorp.com](http://www.ipscorp.com)
    - h. Leemco, Colton, CA [www.leemco.com](http://www.leemco.com)
    - i. Netafim, Inc. [www.netafimusa.com](http://www.netafimusa.com)
    - j. Paige Electric, Union, NJ [www.paigewire.com](http://www.paigewire.com)
    - k. Rain Bird Sprinkler Manufacturing Corp, Glendora, CA [www.rainbird.com](http://www.rainbird.com)
    - l. T. Christy Enterprises, Inc. (Christy's), Anaheim, CA [www.tchristy.com](http://www.tchristy.com)
    - m. 3M, Austin, TX [www.3m.com/elpd](http://www.3m.com/elpd).

- B. Materials:
1. Pea Gravel:
    - a. For use around drains, valves, and quick couplers.
    - b. 1/2 inch maximum dimension, washed rock.
  2. Sand:
    - a. For use of backfill around all PVC MAINLINE AND LATERAL LINE pipe..
    - b. Fine granular material naturally produced by rock disintegration and free from organic material, mica, loam, clay, and other deleterious substances.
  3. Native Material: Soil native to project site free of wood and other deleterious materials and rocks over 1 inch.
  4. Topsoil: Approved imported material without rocks, roots, sticks, clods, debris, and other foreign matter over 1 inch longest dimension.
  5. Pipe, Pipe Fittings, And Connections:
    - a. Pipe shall be continuously and permanently marked with Manufacturer's name, size, schedule, type, and working pressure.
    - b. Pipe sizes shown on Drawings are minimum. Larger sizes may be substituted at no additional cost to Owner.
    - c. Pipe:
      - 1) Pressure Lines: Refer to irrigation schedule.
      - 2) Lateral Lines: Refer to irrigation schedule.
      - 3) Main Filter Assembly Piping: Refer to irrigation schedule and details.
      - 4) Quick Coupler Piping: Refer to irrigation details.
    - d. Fittings: Lateral Line - Same material as pipe, except where detailed otherwise.  
Mainline – All fittings to be SCH 80, except where detailed otherwise. All fittings 3” and larger to be Leemco Ductile Iron or approved equal. All mainline fittings to be ductile iron.
      - 1) Self-Restrained Fitting: Fittings shall be ductile iron, slanted, deep bell, gasket style made in accordance with ASTM A-536, Grade 65-45-12 & AWWA C153. Fittings shall have joint restraint system cast within the fitting. Joint restraints shall have blunt cast serrations, so damage of the outer pipe surface will not occur. Machined threaded restraints shall not be allowed. All gaskets shall be manufactured of high grade EPDM rubber and shall be rib-enforced “U-Cup” design to seal and assist in restraining pipe at all pressures. Epoxy Coating on interior & exterior surfaces of fittings shall be fusion bonded epoxy, 10-12 mil thickness. The epoxy coated fittings shall pass 90-Day immersion tests per CSA Z245.20-98. All DPS fittings shall have Epoxy Coating as standard finish. All fittings shall be manufactured by Leemco, Inc., U.S.A. or approved equal.
      - 2) Joint Restraint: All changes of directions and reductions shall be mechanically restrained. Additional adjacent joints shall also be restrained as per manufactures recommendations. Joint Restraints shall be ductile iron and made in accordance with ASTM A-536, Grade 65-45-12 & AWWA C153. All Restraints shall have blunt cast serrations. Machined threaded restraints shall not be allowed. Optional Epoxy Coating shall be fusion bonded epoxy, 10-12 mil thickness. The epoxy coated restraints shall pass 90-Day immersion tests per CSA Z245.20-98. All Joint Restraints shall be manufactured by Leemco, Inc., U.S.A. or approved equal.
      - 3) Lateral Angle Valve: Lateral to mainline connection shall be made with ductile iron, resilient seated angle valve. All valve components shall be constructed of ductile iron and 300-series stainless steel. The valve stem shall be fine threaded stainless steel, O-Ring sealed for ease of operation. No bronze stems will be allowed. Valve connection to the mainline fitting shall be spigot x bell, mechanically attached and swivel about the base 360 degrees to allow positioning of valve outlet to any desired direction. Valve outlet shall be deep bell, gasket and equipped with integrally cast joint restraint clamps to securely fasten PVC pipe to the valve. Restraint shall have cast blunt serrations. Machined threaded restraints shall not be allowed. Swivel style extensions shall be stackable. Valve shall have a shroud around the valve



- stem to accept IPS PVC sleeve. All lateral to mainline transitions shall be as manufactured by Leemco, Inc., U.S.A. or approved equal.
- 4) Mainline Gate Valve: All mainline gate valves shall be resilient wedge and conform to AWWA standards. Gate valves shall be spigot x bell and bell x bell, with self-restrained ends to mechanically attach to a Leemco fitting or PVC pipe. Restraints shall have blunt cast serrations. Machined threaded restraints shall not be allowed. Valves shall have a shroud around the operating nut to accept a pipe sleeve to provide dirt-free access to actuate the valve. All mainline valves shall be as manufactured by Leemco, Inc., U.S.A. or approved equal.
  - e. Sleeves:
    - 1) Under Parking Area And Driveway Paving: Schedule 40 PVC Pipe.
    - 2) All Other: Class 200 PVC Pipe.
    - 3) Sleeve diameter shall be two times larger than pipe installed in sleeve.
    - 4) Flow Sensor Communication wire and Control wire to controller to be placed in separate 1 1/2" gray electrical conduit. Control wire from Decoder to distant valve to also be located in separate 1 1/2" gray electrical conduit
  6. Sprinkler Heads:
    - a. Each type of head shall be product of single manufacturer.
    - b. Spray Heads in Lawn Areas - Refer to Irrigation Schedule.
    - c. Rotator Heads – Refer to Irrigation Schedule.
    - d. Gear Driven Rotor Pop-ups – Refer to Irrigation Schedule.
  7. Sprinkler Risers:
    - a. All stationary spray heads shall have pre-manufactured swing assemblies or equal approved as approved by Architect before installation – Refer to irrigation details.
    - b. All 3/4" inlet rotor pop-up sprinklers shall have an adjustable pre-assembled swing assembly riser – Refer to irrigation details.
    - c. All 1" inlet rotor pop-up sprinklers shall have an adjustable pre-assembled double swing joint riser – Refer to irrigation details.
    - d. Pop-up rotor sprinkler heads shall have adjustable riser assembly, three ell swing joint assembly, unless detailed otherwise on Drawings. These swing joint fittings shall be of schedule 40 PVC plastic and nipples Marlex Street 90's unless otherwise designated on Drawings. Horizontal nipple parallel to side of lateral line shall be 12 inches long minimum. All other nipples on swing joint riser shall be of length required for proper installation of sprinkler heads.
    - e. Pop-up sprinkler heads shall have risers – Refer to irrigation details.
  8. Automatic Rain Sensors (supplied by Approved Distributor or Approved Manufacturer):
    - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - 1) Refer to Irrigation Schedule.
  9. Automatic Irrigation Control Wiring:
    - a. Traditional control wire shall be UF-UL listed, color coded PE insulated copper conductor direct burial size 14. For wire runs exceeding 3,300 feet (1 005.84 meter), use 12 AWG wire. Do not use green color coded wire.
    - b. Install all wire junctions in 10 inch round valve box.
    - c. Communication wire between controller and hudrometer to be Paige Electric PE-393. Run underground communication wire in separate 1 1/2" gray electrical conduit.
    - d. Paige Electric Cadweld Connection.
    - e. Waterproof Wire Connectors:
      - 1) Control wire connections shall consist of a properly-sized wire nut inserted in a waterproof grease cap.
      - 2) Type Two Acceptable Products:
        - 1) Northstar Industries – SURESPLICE SK 14-12G
        - 2) 3M DBR/Y-6 - White Stress Marks on bubbles must be seen for proper strain relief
        - 3) Equal as approved by Architect before installation.
    - f. Conduit:
      - 1) Exterior applications:

- 1) Galvanized IMC. Where in contact with earth or concrete, wrap galvanized IMC conduit and fittings completely with vinyl tape.
- 2) In-ground: commercial grade grey conduit.
- 3) Size conduit as follows:
- 4) Traditional Wiring:

| PVC Sch. 40 Conduit |                  |                |                    |                    |                |                    |
|---------------------|------------------|----------------|--------------------|--------------------|----------------|--------------------|
| Wire Size (AWG)     | Number of Wires  |                |                    |                    |                |                    |
| 14                  | 6                | 11             | 20                 | 29                 | 43             | 61                 |
| 12                  | 5                | 7              | 17                 | 23                 | 35             | 54                 |
| Conduit Size        | 3/4 inch (19 mm) | 1 inch (25 mm) | 1 1/4 inch (32 mm) | 1 1/2 inch (38 mm) | 2 inch (50 mm) | 2 1/2 inch (64 mm) |

- g. Lightning Arrestor:
  - 1) Provide grounding and Lightning Arrestor(s) as required by Manufacturer.
  - 2) Valve Boxes
    - 1) Type Two Acceptable Products:
      - (1) Carson Industries: 10 inch (255 mm) Model 0910.
      - (2) Equal as approved by Architect before use. See Section 01 6200.
    - 2) Valve Box Supports:
      - (1) Standard size fired clay paving bricks without holes.
10. Automatic controllers – Refer to Irrigation Schedule.
  - a. Smart Rain Controller – The system shall consist of the following components:
    - 1) Inspection of system.
    - 2) Vandal resistant powder coated steel finish suitable for either indoor or outdoor environments. Provide stainless steel where outdoor conditions require non-corrosive material.
    - 3) Wall mounted enclosure assembly.
    - 4) Key-Lock.
    - 5) Low Profile Antenna.
    - 6) One (1) year ET subscription.
    - 7) Site consultation.
    - 8) All other components required for complete and operational system.
  - b. Automatic Rain Sensors (supplied by Approved Distributor):
    - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - 1) Refer to irrigation schedule.
11. Hydrometer:
  - a. Install as detailed and as per manufacturer's recommendations.
  - b. If installed on secondary system, install downstream of filter.
  - c. Connect communication cables to Smart Controller. Run cables within conduit as specified in specification.
12. Automatic Filter (Refer to irrigation details and specifications)
  - a. Install 24 inches minimum from structures or hardscaping.
  - b. Install 3 inch drain line from filter to nearest storm drain catch basin.
  - c. Enclosures:
    - 1) Design Criteria:
      - (1) Commercial grade aluminum enclosure.
      - (2) Sufficient in size to allow ease of access of components.

- (3) Lockable: Provide with pad lock approved by Facilities Manager.
  - (4) Provide Insulated blanket.
13. Valves:
- a. Manual Drain Valves – Refer to Irrigation Schedule and Details.
  - b. Automatic Valves – Refer to Irrigation Schedule.
  - c. Isolation Valves – Refer to Irrigation Schedule
  - d. Main Filter - Refer to Irrigation Plan, Details, and Specifications.
  - e. Pressure Reducing Valve – Refer to Irrigation Plan, Details and Specifications.
  - f. Quick Coupling Valves and Keys – Refer to Irrigation Schedule.
14. Valve Accessories:
- a. Valve manifolds – Refer to irrigation details.
  - b. Valve Boxes And Extensions:
    - 1) Colors:
      - 1) Green: Lawn areas.
      - 2) Tan: Bare soil and rock mulch areas.
    - 2) Type Two Acceptable Products:
      - 1) Carson Industries: Refer to irrigation details.
  - c. Valve ID tags:
    - 1) Type Two Acceptable Products:
      - 1) Christy ID Tags.
      - 2) Equal as approved by Architect before use.
  - d. Valve Box Supports: Standard size fired clay paving bricks without holes or concrete masonry units (CMU). Refer to details for requirements.
15. Solvent Cement:
- a. Primer:
    - 1) Meet ASTM F656 standard and applicable sections of latest edition of 'Uniform Plumbing Code'.
    - 2) Meet NSF/ANSI standard for use on potable water applications.
    - 3) Low VOC emissions and compliant with LEED.
    - 4) Product: Weld-On P-70 primer by IPS.
  - b. PVC Solvent Cement:
    - 1) Heavy bodied, medium setting, high strength:
      - 1) Meet ASTM D2564 standard and applicable sections of latest edition of 'Uniform Plumbing Code'.
      - 2) Meet NSF/ANSI standard for use on potable water applications.
      - 3) Meet CSA standards for use in pressure and non-pressure potable water applications.
      - 4) Low VOC emissions and compliant with LEED.
      - 5) Product: Weld-On 711 Low VOC PVC Cement by IPS.
16. Drip Assembly (Refer to irrigation details):
- a. Install pipe providing for expansion and contraction as recommended by Manufacturer.
  - b. Cut tubing square and remove burrs at cut ends.
  - c. Locate drip emitter on uphill side of plant within rootball zone. Where significant slope does not occur, locate emitter on backside of plant.
  - d. Set emitter to be visible to maintenance personnel.
  - f. Layout in-line tubing for trees as indicated on Drawings.
  - g. Locate distribution tubing on top of soil but under bark or rock mulch and filter fabric.
  - h. Staple in-line tubing to ground at *6 foot* maximum intervals and within *12 inches* of ends and intersections.
  - i. Assembly Using 'Funny Pipe' Type Joints:
    - 1) Connect distribution tubing to lateral line using barbed ell fitting.
    - 2) Connect fitting to distribution tubing using straight barbed fitting with *1/2 inch* threaded end.
17. Other Components:

- a. Recommended by Manufacturer and subject to Architect's review and acceptance before installation.
- b. Provide components necessary to complete system and make operational.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLERS**

- A. Approved controller installers:
  1. Provide Qualification documentation as described under Informational Submittals in Part 1 GENERAL:
    - a. Smart Rain: Factory approved installer having completed Smart Rain certified contractor training (see Smartrain.net for details).

#### **3.2 EXAMINATION**

- A. Site Verification of Conditions: Perform pressure test at stub-out on main water line provided for irrigation system, or at near-by fire hydrant. Notify Architect if POC pressures over *130 psi* or under *110 psi* are found to determine if some re-design of system is necessary before beginning work on system.

#### **3.3 PREPARATION**

- A. Protection:
  1. Repair or replace work damaged during course of the Work at no additional cost to Owner. If damaged work is new, installer of original work shall perform repair or replacement.
  2. Do not cut existing tree roots measuring over *2 inches* in diameter in order to install irrigation lines.
- B. Layout of Irrigation Heads:
  1. Location of heads and piping shown on Drawings is approximate. Actual placement may vary slightly as is required to achieve full, even coverage without spraying onto buildings, sidewalks, fences, etc.
  2. Contractor to survey the location of all large rotors in playfields and practice fields.
  3. During layout, consult with Landscape Architect to verify proper placement and make recommendations, where revisions are advisable.
  4. Minor adjustments in system layout will be permitted to avoid existing fixed obstructions.
  5. Make certain changes from Contract Documents are shown on record drawings.

#### **3.4 INSTALLATION**

- A. Mainline Trenching and Backfilling:
  1. Pulling of pipe is not permitted.
  2. Over-Excavate trenches 6 inches and bring to specified depth by filling with sand as specified under PRODUCTS. The bottom of the trenches shall be compacted hard and graded to obtain required fall. Remove rocks larger than *1-1/2 inch* in any direction from bottom of trench. Separate out rocks larger than *1-1/2 inch* in any direction uncovered in trenching operation from excavated material and remove from areas to receive landscaping.

3. All mainline piping shall be bedded upon a 6 inch minimum layer of sand. The sand shall be graded to provide proper pipe slope. Bedding shall be compacted, by suitable equipment, to a density of not less than 95 percent as determined by ASTM D-1557.
  4. Install detectable Blue color "Water Line Below" Burial Marking Tape on top of sand layer 4 inches above Irrigation main line.
  5. Do not cover pressure main, sprinkler pipe, or fittings until Architect has inspected and approved the system. After pipelines have been tested, inspected, and approved, the trench shall be backfilled with a 6 inch layer of sand on top of pipe, with 2 inches minimum on the sides. Backfill shall be compacted, by suitable equipment, to a density of not less than 95 percent as determined by ASTM D-1557. Install polyethylene marker tape, designed for long term burial, on top of sand before placing topsoil. Top 12 inches of backfill shall be conditioned topsoil as specified in Sections 32 9113 and 32 9119.
  6. After topsoil has been placed the contractor is to water settle all trenches by saturating backfill material to the depth of the pipe. Once trenches are dry, contractor to add additional topsoil as needed. This is in addition to previously specified compacting procedures.
- B. Lateral Line Trenching and Backfilling:
1. Pulling of pipe is not permitted.
  2. Over-excavate trenches 2 inches and bring back to specified depth by filling with sand as specified under PRODUCTS. Separate out rocks larger than 1-1/2 inch in any direction uncovered in trenching operation from excavated material and remove from areas to receive landscaping.
  3. Cover pipe sides with 2 inches minimum of sand as specified under PRODUCTS. Remainder of backfill to within 12 inches of finish grade shall be sand as specified under PRODUCTS. Top 12 inches of backfill shall be conditioned topsoil as specified in Sections 32 9113 and 32 9119.
  4. Do not cover pressure main, sprinkler pipe, or fittings until Landscape Architect or School District Representative has inspected and approved system.
  5. In addition to standard compacting procedures, all trenches are to be water settled by back-filling trenches with specified materials and saturating backfill material to the depth of the pipe. Once trenches are dry, contractor to add additional topsoil as needed.
- C. Sleeving and Conduits:
1. Sleeve all control wire in 1½" Gray Electrical Conduit. Install in mainline trench beneath irrigation mainline with a minimum 4 inch separation. Extend conduit between and into all valve boxes. Provide 2" of foam backer rod in electrical conduit sealed with 2" of waterproof foam sealant obtained from pond equipment supplier in last 2" of conduit.
  2. Sleeve water lines under walks and paving. Continue 1 ½" gray electrical conduit with control wires under walks and paving.
  3. Extend sleeves 6 inches beyond walk or pavement edge. Cap sleeves until pipes and wires are installed to keep sleeve clean and free of dirt and debris. Provide 10' min. radius on all sleeving. 45 and 90 degree fittings will not be allowed.
  4. Use one water pipe maximum per sleeve. Sleeve control wiring in separate sleeve.
  5. Position sleeves with respect to buildings and other obstructions so pipe can be easily removed.
  6. Glue all sleeve and conduit joints to keep water out.
  7. At all sleeve locations in concrete or hardscape, before burying the sleeves, using a grinder wheel, indicate a 2 1/2 inch tall by ½ inch deep 'I V I' at both ends of sleeve location.
  8. When installing multiple sleeves, all sleeves to have a horizontal separation of 8" minimum.
- D. Grades And Draining:
1. In localities where winterization is required, grade piping so system can be completely drained or blown out with compressed air. If system is not designed to be blown out with compressed air:
    - a. Slope pipe to drain to control valve box where possible.

- b. Where this is not possible, slope pipe to a minimum number of low points. At these low points, install:
  - 1)  $3/4$  inch brass ball valve for manual drain. Do not use automatic drain valves.
  - 2) Install 2 inch Class 200 PVC pipe over top of drain and cut at finish grade.
  - 3) Provide yellow hard plastic valve cap marker.
  - 4) Provide three cu ft pea gravel sump at outlet of each drain.
- c. Slope pipes under parking areas or driveways to drain outside these areas.
- d. Provide and install quick-coupling valve or valves in location for easy blowout of entire system.

E. Installation of Pipe:

- 1. Install pipe in manner to provide for expansion and contraction as recommended by Manufacturer.
- 2. Unless otherwise indicated on Drawings, install main lines and lateral lines connecting pop-up rotor and impact sprinklers with minimum cover of 18 inches and a maximum cover of 24 inches based on finished grade. Install remaining lateral lines, with minimum of 12 inches and a maximum of 18 inches of cover based on finish grade.
- 3. Install pipe and wires under driveways or parking areas in specified sleeves 18 inches below finish grade or as shown on Drawings. Install manual drain valves at low point in sleeve.
- 4. Locate no sprinkler head closer than 12 inches from building foundation. Heads immediately adjacent to mow strips, walks, or curbs shall be one inch below top of mow strip, walk, or curb and have one to 3 inches clearance between head and mow strip, walk, or curb.
- 5. Cut plastic pipe square. Remove burrs at cut ends before installation so unobstructed flow will result.
- 6. Make solvent weld joints as follows:
  - a. Do not make solvent weld joints if ambient temperature is below 40 deg F.
  - b. Clean mating pipe and fitting with clean, dry cloth and apply one coat of P-70 primer to each.
  - c. Apply uniform coat of 711 solvent to outside of pipe.
  - d. Apply solvent to fit in similar manner.
  - e. Re-apply light coat of solvent to pipe and quickly insert into fitting.
  - f. Give pipe or fitting a quarter turn to insure even distribution of solvent and make sure pipe is inserted to full depth of fitting socket.
  - g. Hold in position for 15 seconds minimum or long enough to secure joint.
  - h. Wipe off solvent appearing at outer shoulder of fitting.
  - i. Do not use excessive amount of solvent thereby causing obstruction to form on inside of pipe.
  - j. Allow joints to set at least 24 hours before applying pressure to PVC pipe.
- 7. Tape threaded connections with teflon tape.
- 8. If pipe is 3 inches or larger, install using self restraining fittings and joints wherever change of direction occurs on PVC main pressure lines. Tighten bolts to manufacturer torque settings.

F. Control Valves, Controller and Related Components

- 1. Install valves in standard size plastic boxes with reinforced heavy duty plastic covers. Locate valve boxes within 12 inches of sidewalks or shrub bed edges with tops at finish grade. (Refer to Details). Do not install more than one valve per valve box.
- 2. Place 6 inches minimum of pea gravel below CMU (cinder blocks) supporting valve boxes to drain box. Set valve boxes over valve so valve is centered in the box. Set cover of valve box even with finish grade. Extend pea gravel 3 inches minimum beyond limits of valve box and maintain 4 inches minimum between bottom of valve and top of pea gravel. Wrap entire gravel cavity with filter fabric. Valve boxes to be 12 inches deep. Valve box cavity shall be reasonably free from dirt and debris. Install labeled Valve ID Tags for each valve.
- 3. Wiring:

- a. Total length of wire in system is limited to 10,000 ft. Maximum distance from any system device to controller is 4000 ft.
    - b. Wire loops are permissible, but length of wire in loop is limited to 2,000 ft. for normal installation, it is recommended that paired wire be installed in 1 in 5 foot twist to reduce effects of nearby noise sources on communications.
  - 4. Install Controllers, control wires, and valves in accordance with Manufacturer's recommendations and according to electrical code.
  - 5. Extend extra control wires 24 inches and leave coiled in each valve box
  - 6. Grounding devices as per plans and details.
- G. Filter Assembly (refer to irrigation details):
- 1. Install 24 inches minimum from structures or hardscaping.
  - 2. Flush out system prior to installing filter assembly.
  - 3. Install 3" drain line to Storm Sewer using PVC SCH 40 Pipe.
- H. Sprinkler Heads (refer to irrigation details):
- 1. Prior to installation of sprinkler heads, open control valves and use full head of water to flush out system.
  - 2. Set sprinkler heads and quick-coupling valves perpendicular to finish grade.
  - 3. Do not install sprinklers using side inlets. Install using base inlets only.
  - 4. Set sprinkler heads at a consistent distance from existing walks, curbs, and other paved areas and to grade by using specified components or other method demonstrated in Pre-Construction Conference. Heads are to be located no closer than 1 inch from adjacent paving or curb and no further than 2 inches.
- I. Before installation of sprinkler heads, open control valves and use full head of water to flush out system.
- J. Arrange valve stations to operate in an easy-to-view progressive sequence around building. Tag valves with waterproof labels showing final sequence station assignments. Note any changes on as-builts.

### 3.5 FIELD QUALITY CONTROL

- A. Field Tests and Inspections:
- 1. Irrigation System:
    - a. Notify Architect 2 working days minimum before conducting test.
    - b. Before backfilling main line, test pressure at 100 psi minimum for 2 hours minimum and make certain there are no leaks. Any decrease in pressure signifies that there is a leak. Take pictures of the pressure gauge at the beginning of the 2 hours and at the end. Provide copies of the pictures to the Landscape Architect.
  - 2. Test Report:
    - a. Report of Pressure Test results along with photographs of test results are to be provided to Landscape Architect at completion of testing. Pressure test report shall be included in the Operation and Maintenance Manual.
  - 3. Controller Testing:
    - a. Verify controller is installed correctly and will automatically adjust irrigation run times in response to environmental changes using sensor and/or weather information to manage watering times and frequency.
  - 4. Pre-substantial Inspection:
    - a. Landscape Architect will review irrigation system before substantial completion.
    - b. Approval to irrigation system to be in writing.
  - 5. Substantial Completion Walkthrough:
    - a. Landscape Architect will inspect site and create list of non-conforming items to be resolved prior to Irrigation Final Acceptance. Date on this list will act as date of Landscape Substantial Completion.

- b. Installations completed after water source has been turned off for season, as determined by Landscape Architect, will be inspected following spring after system can be checked for proper operation.
  - 6. Irrigation Final Inspection:
    - a. Irrigation Final Acceptance will be awarded when all non-conforming work is brought into conformance.
    - b. Landscape Architect will create signed certificate to be included in Operations and Maintenance Manual at completion of all non-conforming work.
- B. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
- 1. Underground Sprinkler System:
  - 2. Correct any work found defective or not complying with Contract Document requirements at no additional cost to the Owner.

### **3.6 ADJUSTING**

- A. Adjust sprinkler heads to proper grade when turf is sufficiently established to allow walking on it without appreciable harm. Such lowering and raising of sprinkler heads shall be part of original contract with no additional cost to Owner.
- B. Adjust sprinkler heads for proper distribution and trim so spray does not fall on building. Adjust sprinkler heads to be plumb.
- C. Adjust watering time of valves to provide proper amounts of water to plants.

### **3.7 CLOSEOUT ACTIVITIES**

- A. Instruction of Owner:
  - 1. After system is installed and approved, instruct Owner's designated personnel in complete operation and maintenance procedures.
  - 1. Controller Training:
    - a. Manufacturer's approved Distributor to instruct Owner's designated personnel in complete operation and maintenance of Controller.
    - b. Manufacturer's approved Distributor to review terms of Warranty, Maintenance procedures and contact information with Owner's Representative.

**END OF SECTION**



## SECTION 32 9001

### COMMON PLANTING REQUIREMENTS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Includes But Not Limited To:
  - 1. Common procedures and requirements for landscaping work.
- B. Related Sections:
  - 1. Section 32 0501: Common Earthwork Requirements.
  - 2. Section 32 8423: Underground Sprinklers.

##### 1.2 SUBMITTALS

- A. Quality Assurance / Control:
  - 1. Pre-Bid Submission: Verification of plant and shrub quantities and report of discrepancies. Include with submission an itemized list of materials with quantities and units of measure of bark dressing mulch, fertilizers, turf, plants, stakes, herbicide, topsoil, and other landscaping materials anticipated to complete work of this Section. Purpose of submittal is to verify accuracy and consistency of interpretation of Contract Documents by each bidder.
  - 2. Pre-Bid Submission: Landscape Company's certification of specified qualifications.
  - 3. Within 30 days of contract award, provide written guaranty from plant supplier that trees and shrubs specified will be reserved and held for this project. Include location where materials will be held.
- B. Closeout: At completion of landscape work, submit two copies of typewritten instructions recommending procedures to be established by Owner for maintenance of landscape work for one full year after contract maintenance period ends.

##### 1.3 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Landscaping Company:
    - a. Landscaping Company shall be required to produce certification of following requirements minimum 10 days bid opening:
      - 1) Have been in business for period of minimum five years while providing quality of labor and materials specified in this section.
      - 2) Provide evidence of having completed minimum five projects of scope and quality as this project in a timely manner.
      - 3) Produce certifiable list of reputable landscape suppliers from whom it will be purchasing materials to be used on this project.
      - 4) Produce evidence that it employs quality employees with specified experience and in a quantity sufficient to perform work of this Section within time limits established by Contractor.
      - 5) Produce evidence that it employs only those employees who are legal citizens or are legally documented to work in the United States.
  - 2. Workers:

- a. Trained personnel familiar with required planting procedures and Contract Documents shall perform planting.
  - b. Planting shall be performed under direction of foreman or supervisor with minimum five years experience in landscape installations.
- B. Pre-Installation Conferences:
- 1. Participate in pre-installation conference specified in Section 31 2213.
  - 2. Schedule planting pre-installation conference after completion of Fine Grading specified in Section 31 2216, but before beginning landscape work. In addition to requirements of Section 01 3000:
    - a. Establish responsibility for maintenance of new landscaping during all phases of construction period.
    - b. Prepare two typical landscape planting excavations and conduct percolation test to verify that water drains away within two hours. Discuss results of percolation tests with Architect and Owner's representative.

#### **1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver packaged materials in containers showing weight, analysis, and name of Manufacturer. Protect materials from deterioration during delivery and while stored at site.
- B. Deliver sod, plants, trees, and shrubs in healthy and vigorous condition and store in location on site where they will not be endangered and where they can be adequately watered and kept in healthy and vigorous condition.

#### **1.5 SEQUENCING**

- A. Do not plant trees and shrubs until major construction operations are completed. Do not commence landscaping work until work of Sections 31 2216 and 32 8423 has been completed and approved.
- B. Coordinate installation of planting materials during normal planting seasons for each type of plant material required.

### **PART 2 - PRODUCTS: Not Used**

### **PART 3 - EXECUTION**

#### **3.1 INSTALLERS**

- A. Qualification Submittals:
  - 1. Landscape Subcontractor:
    - a. Minimum five (5) years experience in planting installations.
    - b. Minimum five (5) satisfactorily completed planting installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.
    - c. Produce certifiable list of reputable landscape suppliers from whom it will be purchasing materials to be used on this project.
    - d. Produce evidence that it employs quality employees with specified experience and in a quantity sufficient to perform work of this Section within time limits established by Contractor.
    - e. Produce evidence that all employees have legal documents to be working in the United States and that documents have been verified legitimate by the owner.

2. Planting Installer:
  - a. Planting installation shall be performed under direction of foreman or supervisor with minimum five (5) years experience in planting installations similar in size, scope, and complexity. Contractor to provide the name of the foreman, a list of at least 5 similar jobs and 5 references.
  - b. Foreman or supervisor required to attend pre-installation conference.
  - c. Use trained personnel familiar with required planting installation procedures and with Contract Documents.

### **3.2 EXAMINATION**

- A. Inspect site and Contract Documents to become thoroughly acquainted with locations of irrigation, ground lighting, and utilities. Repair damage to these and other items adjacent to landscaping caused by work of this Section or replace at no additional cost to Owner.

### **3.3 PREPARATION**

- A. Before proceeding with work, verify dimensions and quantities. Report variations between Drawings and site to Architect before proceeding with landscape work.
  1. Plant totals are for convenience of Contractor only and are not guaranteed. Verify amounts shown on Drawings.
  2. All planting indicated on Drawings is required unless indicated otherwise.
- B. Protection:
  1. Take care in performing landscaping work to avoid conditions that will create hazards. Post signs or barriers as required.
  2. Provide adequate means for protection from damage through excessive erosion, flooding, heavy rains, etc. Repair or replace damaged areas.
  3. Keep site well drained and landscape excavations dry.

### **3.4 INSTALLATION**

- A. Hand excavate as required.
- B. Maintain grade stakes until parties concerned mutually agree upon removal.
- C. When conditions detrimental to plant growth are encountered, such as rubble fill or adverse drainage conditions, notify Architect before planting.

### **3.5 FIELD QUALITY CONTROL**

- A. Inspection:
  1. Do not place or plant sod, plants, trees, or shrubs until after inspection by Architect to verify they are in healthy and vigorous condition. Notify Architect 48 hours minimum before placing or planting of sod, plants, trees, or shrubs.
  2. Architect will inspect landscaping installation approximately two weeks before Substantial Completion. Replace landscaping that is dead or appears dead as directed by Architect within 10 days of notification and before Substantial Completion.

### **3.6 ADJUSTING**

- A. Replace damaged plantings at no additional cost to Owner.

### **3.7 CLEANING**

- B. Immediately clean up soil or debris spilled onto pavement and dispose of deleterious materials.

### **3.8 PROTECTION**

- A. Protect planted areas against traffic or other use immediately after planting is completed by placing adequate warning signs and barricades.
- B. Provide adequate protection of planted areas against trespassing, erosion, and damage of any kind. Remove this protection after Architect has accepted planted areas.

**END OF SECTION**



### **1.3 SUBMITTALS**

- A. Product Data: Product literature and chemical / nutrient analysis of soil amendments and fertilizers.
- B. Samples: Sample of soil conditioner for approval before delivery to site. Include product analysis list.
- C. Quality Assurance / Control:
  - 1. Delivery slips indicating amount of soil conditioner delivered to Project site.
  - 2. Submit test on topsoil by licensed laboratory before use, using Owner Form 'Topsoil Test Report'. Imported topsoil shall meet minimum specified requirements and be approved by Architect before use.
  - 3. Submit report stating location of source of imported topsoil and account of recent use.

### **1.4 QUALITY ASSURANCE**

- A. Pre-Installation Conference: Participate in pre-installation conference specified in Section 31 2213.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Topsoil:
  - 1. Topsoil in lawn area to be imported – condition as specified below.
  - 2. In planting beds with trees and shrubs, topsoil to be imported throughout entire shrub bed. Other than backfill of trees and shrubs no additional conditioning will be required.

3. Backfill of trees and shrubs to be imported topsoil, conditioned as required in details.
4. Imported Topsoil used in landscaped areas shall be fertile, loose, friable soil meeting following criteria:
  - a. Physical Characteristics:
    - 1) Clean and free from toxic minerals and chemicals, noxious weeds, rocks larger than 1 inch in any dimension, and other objectionable materials.
    - 2) Soil shall not contain more than 2 percent by volume of rocks measuring over 3/32 inch in largest size.
    - 3) Gradation as defined by USDA triangle of physical characteristics as measured by hydrometer.
      - a) Sand: 15 to 60 percent.
      - b) Silt: 10 to 60 percent.
      - c) Clay: 5 to 30 percent.
  - b. Chemical Characteristics:
    - 1) Acidity / alkalinity range: pH 5.5 to 8.0.
    - 2) Soluble Salts: less than 3.0 mmhos/cm.
    - 3) Sodium Absorption Ratio (SAR): less than 6.0.
    - 4) Organic Matter: greater than one percent.
5. Incorporate following amendments, fertilizers and soil conditioners into imported topsoil after topsoil has met the above criteria:
  - a. Acceptable Fertilizers And Application Rates:
    - 1) Spread 30-10-0 fertilizer at a rate of 4 lbs. Per 1000 s.f. and 0-0-0-15 iron fertilizer at a rate of 4 lbs. Per 1000 s.f.
    - 2) Equal as approved by Architect before installation. See Section 016000.
  - b. Acceptable Soil Conditioners And Application Rates:
    - 1) Type One Acceptable Product.
      - a) Soil Pep from Mountain West Products, Rexburg, ID.
      - b) "Other" EPA Class 'A' co-compost or compost with SAR less than 10.0, Soluble Salts less than 5.0, CN ratio of less than 20:1, 98% passing through 3/8 inch mesh screen, 25%-35% moisture or other product approved by Architect before use. See Section 01 6000.
      - c) Apply one of the above acceptable soil conditioners at the following rates:  
Lawn areas - 5 cubic yards per 1000 s.f. in the top 5" depth. Till or pre-mix evenly into topsoil to a 5" min. depth.

Shrub beds – Other than backfill of trees and shrubs no conditioner required.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Do not commence work of this Section until grading tolerances specified in Section 312216 are met.

### 3.2 PREPARATION

- A. Protection: Protect utilities and site elements from damage.
- B. Surface Preparation:
  1. Rip, disk, till, or aerate with approved agricultural aerator to min. depth of 6 inches.
  2. Seven days maximum before beginning seeding and planting:
    - a. Loosen area 4 inches deep, dampen thoroughly, and cultivate to properly break up clods and lumps.
    - b. Rake area to remove clods, rocks, weeds, roots, and debris.

- c. Grade and shape landscape area to bring surface to true uniform planes free from irregularities and to provide drainage and proper slope to catch basins.
  - 3. Limit use of heavy equipment to areas no closer than 6 feet from building or other permanent structures. Use hand held tillers for preparation of subsoil in areas closer then 6 feet.
- C. Screen Imported Topsoil: Screen all Imported topsoil to remove rock measuring 3/32". Contractor to ensure that topsoil contains no more than 2 percent by volume of rocks measuring over 3/32 inch in largest size.

### 3.3 PERFORMANCE

- A. Site Tolerances:
  - 1. Total Topsoil Depth:
    - a. Lawn Planting Areas: 5 inches minimum.
    - b. Tree and Shrub Planting Areas: 12 inches minimum throughout entire shrub bed area.
  - 2. Elevation of topsoil relative to walks or curbs prior to adding soil amendments –
    - a. Sodded Lawn Areas - 2 inches below except for athletic fields. Elevation at athletic fields to be flush with adjacent concrete.
    - b. Shrub & Ground Cover Areas - 8 inches below to allow for 8" of rock mulch.
    - c. Shrub Beds with curb – 14" below to allow for 8" of rock mulch, 6" below top of curb.
  - 3. Elevation of topsoil relative to concrete waterways and catch basins –
    - a. Sodded Lawn Areas – Flush with top of concrete.
    - b. Shrub & Ground Cover Areas – Flush with top of concrete.
- B. Do not expose or damage existing shrub or tree roots.
- C. Before placing topsoil, contractor to rip, disk, till, or aerate with approved agricultural aerator to minimum depth of 6 inches.
- D. Distribute approved imported, screened, conditioned topsoil. Provide sufficient topsoil required to bring surface to specified elevation relative to walk, mowstrip or curb.
- E. Where topsoil depth is 12 inches or greater, place topsoil in layers not to exceed 6 inches and, to prevent settling, compact to 85 percent relative density in accordance with ASTM D 1557. Do not place topsoil whose moisture content makes it prone to compaction during placement process.
- F. Slope grade away from building for 12 feet minimum from walls at slope of 1/2 inch in 12 inches minimum unless otherwise noted. High point of finish grade at building foundation shall be 6 inches minimum below finish floor level. Direct surface drainage in manner indicated on Drawings by molding surface to facilitate natural run-off of water. Fill low spots and pockets with topsoil and grade to drain properly.
- G. Play Field - Prior to finalizing the grading, Contractor to apply sufficient water to wet the soils to a 12" depth. Once the play fields are dry, Contractor will roll the entire field both directions with a 200-350 lb. roller. Contractor will then have the play fields red-headed with the proposed grades. Proposed grades will be marked at 25' on center for athletic fields and 50' on center for practice or play fields. Contractor will then grade to the proposed grades with a differential of no more that 1/2" from grades shown on the grading and drainage plans. Grading of all playfields to be bladed with a grader using a 12' blade with Laser capabilities.
- H. For areas other than playfield - Prior to finalizing the grading, Contractor to apply sufficient water to wet the soils to a 12" depth. Once the areas are dry, Contractor will roll the entire area both directions with a 200-350 lb. roller. Contractor will then grade to the proposed grades with a differential of no more than 1/2" from grades shown on the grading and drainage plans.



- I. After landscape areas have been prepared, take no heavy objects over them except lawn rollers. Immediately before planting lawn and with topsoil in semi-dry condition, roll areas that are to receive lawn in two directions at approximately right angles with water ballast roller weighing 100 to 300 lbs, depending on soil type. Rake or scarify and cut or fill irregularities that develop as required until area is true and uniform, free from lumps, depressions, and irregularities.

**END OF SECTION**

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## SECTION 32 9223

### LAWN / SODDING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Includes But Not Limited To:
  - 1. Furnish and install sodded lawn as described in Contract Documents.
- B. Related Sections:
  - 1. Section 32 90 01: Common Planting Requirements.

##### 1.2 DELIVERY, STORAGE, AND HANDLING

- A. Harvest, deliver, store, and handle sod in accordance with requirements of 'American Sod Producers (ASPA) Specifications for Turfgrass Sod Materials and Transplanting / Installing.'
- B. Cut and lift sod by method acceptable to Architect. Cut sod in pieces approximately 3/4 to one inch thick. Roll or fold sod so it may be lifted and handled without breaking or tearing and without loss of soil.
- C. Schedule deliveries to coincide with topsoil operations and laying. Keep storage at job site to minimum without causing delays.
  - 1. Deliver, unload, and store sod on pallets within 24 hours of being lifted.
  - 2. Do not deliver small, irregular or broken pieces of sod.
- D. During wet weather, allow sod to dry sufficiently to prevent tearing during lifting and handling. During dry weather, protect sod from drying before installation. Water as necessary to insure vitality and to prevent excess loss of soil in handling. Sod that dries out before installation will be rejected.

##### 1.3 SEQUENCING

- A. Do not commence work of this Section until work of Sections 32 91 13 and 32 93 00 has been completed and approved.

#### PART 2 - PRODUCTS

##### 2.1 MATERIALS

- A. Certified Sod:
  - 1. Superior sod grown from certified, high quality, seed of known origin or from plantings of certified grass seedlings or stolons:
    - a. Assure satisfactory genetic identity and purity.
    - b. Assure over-all high quality and freedom from noxious weeds or an excessive amount of other crop and weedy plants at time of harvest.
  - 2. Sod in lawn areas shall be a water-wise Kentucky Bluegrass blend.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Site Tolerances: Final grade of soil after sodding of lawn areas is complete shall be one inch below top of adjacent pavement of any kind.
  
- B. Laying of Sod:
  - 1. Lay sod during growing season. Sodding during dry summer period, at freezing temperatures, or over frozen soil is not acceptable.
  - 2. Lay sod within 36 hours of being lifted.
  - 3. Lay sod in rows with joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with a sharp knife.
  - 4. Lay sod flush with adjoining existing sodded surfaces.
  - 5. Do not sod slopes steeper than 3:1. Consult with Architect for alternate treatment.
  
- C. After Sodding Is Complete:
  - 1. Roll horizontal surface areas in two directions perpendicular to each other.
  - 2. Repair and re-roll areas with depressions, lumps, or other irregularities. Heavy rolling to correct irregularities in grade will not be permitted.
  - 3. Water sodded areas immediately after laying sod to obtain moisture penetration through sod into top 4 inches of topsoil.

### **3.2 FIELD QUALITY CONTROL**

- A. Inspection:
  - 1. Sodded areas will be accepted at final inspection if:
    - a. Sodded areas are properly established.
    - b. Sod is free of bare and dead spots and is without weeds.
    - c. No surface soil is visible when grass has been cut to height of 2 inches.
    - d. Sodded areas in lawn have been mowed a minimum of 4 times.
  - 2. Areas sodded after November 1st will be accepted following spring (May 1st) approximately one month after start of growing season if specified conditions have been met.

**END OF SECTION**

## SECTION 32 9300

### EXTERIOR PLANTS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Includes But Not Limited To:
  - 1. Furnish and install landscaping plants as described in Contract Documents.
- B. Related Sections:
  - 1. Section 32 9001: Common Planting Requirements.

##### 1.2 REFERENCES

- A. American Nursery & Landscape Association / American National Standards Institute:
  - 1. ANLA / ANSI Z60.1-2004, 'American Standard for Nursery Stock.'

##### 1.3 SUBMITTALS

- A. Samples: Top dressing mulch for approval before delivery to site.

##### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver healthy and vigorous trees and shrubs.
  - 1. Do not prune before delivery, except as approved by Architect.
  - 2. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping and other handling and tying damage.
  - 3. Do not bend or bind-tie trees or shrubs in such a manner as to destroy natural shape.
  - 4. Provide protective covering during delivery.
- B. Handle balled stock by root ball or container. Do not drop trees and shrubs during delivery.
- C. Deliver trees, shrubs, ground covers, and plants after preparations for planting have been completed and install immediately.
  - 1. If planting is delayed more than six hours after delivery, set planting materials in shade and protect from weather and mechanical damage.
  - 2. Set balled stock on ground and cover ball with soil, saw dust, or other acceptable material approved by Architect. Do not place on pavement.
  - 3. Do not remove container-grown stock from containers before time of planting.
  - 4. Water root systems of trees and shrubs stored on site with fine mist spray. Water as often as necessary to maintain root systems in moist condition.

##### 1.5 SEQUENCING

- A. Do not commence work of this Section until work of Section 32 9113 has been completed and approved.

## 1.6 WARRANTY

- A. Guarantee furnished shrubs, ground covers, and vines to live and remain in strong, vigorous, and healthy condition for one year minimum from date landscape installation is accepted as complete.
- B. Guarantee trees to live and remain in strong, vigorous, and healthy condition for one year from date landscape installation is accepted as complete.

## 1.7 OWNER'S INSTRUCTIONS

- A. Provide written instructions covering maintenance requirements by Owner for first 90 days of guarantee period beyond Contract maintenance period specified in Section 320101.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Plants:
  - 1. Conform to requirements of Plant List and Key on Drawings and to ANSI Z60.1.
  - 2. Nomenclature: Plant names used in Plant List conform to 'Standardized Plant Names' by American Joint Committee on Horticultural Nomenclature except in cases not covered. In these instances, follow custom of nursery trade. Plants shall bear a tag showing the genus, species, and variety of at least 10 percent of each species delivered to site.
  - 3. Quality:
    - a. Plants shall be sound, healthy, vigorous, free from plant disease, insect pests or their eggs, noxious weeds, and have healthy, normal root systems. Container stock shall be well established and free of excessive root-bound conditions.
    - b. Do not prune plants or top trees prior to delivery.
    - c. Plant materials shall be subject to approval by Architect as to size, health, quality, and character.
    - d. Bare root trees are not acceptable.
    - e. Provide plant materials from licensed nursery or grower.
  - 4. Measurements:
    - a. Measure height and spread of specimen plant materials with branches in their normal position as indicated on Drawings or Plant List.
    - b. Measurement should be average of plant, not greatest diameter. For example, plant measuring 15 inches in widest direction and 9 inches in narrowest would be classified as 12 inch stock.
    - c. Plants properly trimmed and transplanted should measure same in every direction.
    - d. Measure caliper of trees 6 inches above surface of ground.
    - e. Where caliper or other dimensions of plant materials are omitted from Plant List, plant materials shall be normal stock for type listed.
    - f. Plant materials larger than those specified may be supplied, with prior written approval of Architect, and:
      - 1) If complying with Contract Document requirements in all other respects.
      - 2) If at no additional cost to Owner.
      - 3) If sizes of roots or balls are increased proportionately.
  - 5. Shape and Form:
    - a. Plant materials shall be symmetrical or typical for variety and species and conform to measurements specified in Plant List.
    - b. Well grown material will generally have height equal to or greater than spread. However, spread shall not be less than 2/3's of height.
- B. Planting Mix: Refer to details.

- C. Planting Tablets: 21 gram Agriform 20-10-5.
- D. Tree Stakes:
  - 1. Type Two Acceptable Products:
    - a. 2 inch diameter Lodgepole Pine.
    - b. Equal as approved by Architect before installation. See Section 016000.
- E. Tree Staking Ties:
  - 1. Type Two Acceptable Products:
    - a. Flex-straps by Jain Irrigation, Inc.
    - b. Equal as approved by Architect before installation. See Section 016000.
- F. Pre-Emergent Herbicide:
  - 1. Category Four Approved Products. See Section 016000 for definitions of Categories.
    - a. Elanco XL.
    - b. Ronstar.
    - c. Surflan.
- G. Weed Barrier:
  - 1. Acceptable Products:
    - a. De-Whitt PRO-5 Weed Barrier.
    - b. Equal as approved by Architect before bidding. See Section 016000.
- H. Rock Top Dressing Mulch:
  - 1. Type Two Acceptable Products:
    - a. Refer to Planting Plan - Coordinate type, size and color with Landscape Architect.
    - b. Equal as approved by Architect before installation. See Section 016000.
    - c. Required Testing - All rock mulch to have a sieve analysis (ASTM C136) with an accumulative % passing rating of 95% or greater. All material shall meet a resistance to degradation test (ASTM C131) at 500 revolutions per minute with a percent of loss of 45% or less. Contractor to provide test results to Landscape Architect before shipping rock mulch to the site.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Before proceeding with work, check and verify dimensions and quantities. Report variations between Drawings and site to Architect before proceeding with work of this Section.
- B. Plant totals are for convenience only and are not guaranteed. Verify amounts shown on Drawings. All planting indicated on Drawings is required unless indicated otherwise.

### **3.2 PREPARATION**

- A. Layout individual tree and shrub locations and areas for multiple plantings. Stake locations and outline areas. Secure Architect's acceptance before planting. Make minor adjustments as may be requested.

### **3.3 INSTALLATION**

- A. Excavation:
  - 1. If underground construction work or obstructions are encountered in excavation of planting holes, Architect will select alternate locations.
  - 2. Plant Excavation Size:

- a. Diameter: Twice diameter of root ball or container minimum.
  - b. Depth:
    - 1) Shrubs: Twice diameter of root ball or container minimum.
    - 2) Trees: 12 inches minimum deeper than bottom of root ball.
  3. Unless excavated material meets topsoil requirements as specified in Section 319113, remove from landscape areas and do not use for landscaping purposes.
  4. Roughen sides and bottoms of excavations.
- B. Planting:
1. Before planting, test two typical planting excavations with water and verify that water drains away within two hours. Inform Architect in writing if water does not drain properly. Do not plant trees or shrubs in holes that do not properly drain.
  2. Removing Binders And Containers:
    - a. Remove top one / third of wire basket and burlap binders.
    - b. Remove plastic and twine binders from around root ball.
    - c. Remove wood boxes from around root ball. Remove box bottoms before positioning plant in hole. After plant is partially planted, remove remainder of box without injuring root ball.
  3. Plant immediately after removing binding material and containers. Place trees and shrubs in holes so, after watering and settling, top of root ball shall be approximately one inch 25 mm higher than finished grade.
  4. Properly cut off broken or frayed roots.
  5. Center plant in hole and backfill with specified planting mix. Except in heavy clay soils, make ring of mounded soil around hole perimeter to form watering basin.
  6. Add planting tablets in plant pit as follows. Place tablets in relation to root ball as recommended by Manufacturer.
    - a. One Gallon Shrub: 1 tablet.
    - b. 5 Gallon Shrub: 3 tablets.
    - c. 15 Gallon Tree: 4 tablets.
    - d. 24 inch Box Tree: 6 Tablets.
    - e. 2" Caliper B & B Tree: 6 Tablets.
  7. Fill landscape excavations tamped planting mix. Settle by firming and watering to ensure top of ball one inch higher than surrounding soil.
  8. Do not use muddy soil for backfilling.
  9. Make adjustments in positions of plants as directed by Architect.
  10. Thoroughly water trees and shrubs immediately after planting.
  11. At base of each tree, leave 36 inch diameter circle free of any grass.
- C. Supports for New Trees:
1. Provide new supports for trees.
    - a. Remove nursery stakes delivered with and attached to trees.
    - b. Support shall consist of at least two tree stakes driven into hole base before backfill so roots are not damaged. Place stakes vertically and run parallel to tree trunk. Install stakes so 3 feet of stake length is below finish grade.
    - c. Place tree ties 6 to 12 inches below crotch of main tree canopy. Second set of tree ties may be required 18 to 24 inches above finish grade, if directed by Architect.
    - d. Remove tops of tree stakes so top of stake is 6 inches below main tree canopy to prevent damage to tree branches and canopy growth.
  2. Provide guying kits to support Evergreen trees.
- D. Vines: Remove from stakes, untie, and securely fasten to wall or fence next to which they are planted.
- E. Ground Covers: Container-grown unless otherwise specified on Drawings. Space evenly to produce a uniform effect, staggered in rows and intervals shown.
- F. Post Planting Weed Control:
1. Apply specified pre-emergent herbicide to shrub and ground cover planting areas and grass-free areas at tree bases after completion of planting.
  2. Areas shall be free of existing weed growth prior to application of herbicide.



G. Weed Barrier Fabric:

1. After planting and application of herbicide in shrub beds, apply covering of specified weed barrier fabric with fuzzy side down.
2. Achieve 100 percent coverage over ground areas.
3. Overlap seams 6 inches minimum.
4. Staple at 5 feet on center each way with two at each corner.

H. Mulching:

1. After application of herbicide, mulch shrub and ground cover planting areas with 3 inches deep layer of specified top dressing mulch.
2. Cover grass-free area at tree bases with one inch deep layer of soil pep.
3. Place top dressing mulch to uniform depth and rake to neat finished appearance.

**END OF SECTION**

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**DIVISION 33 - UTILITIES**

Section 33 4100

Storm Drainage System

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## SECTION 33 4100

### STORM DRAINAGE SYSTEM

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. The extent of work is indicated on the Drawings and includes the following:
  - 1. New Cleanout Boxes and inlets and Piping.
- B. The work includes but is not limited to:

Perform trenching and backfilling required for work of this Section.

##### 1.2 RELATED SECTIONS

- A. Procedures and quality of excavating, backfilling, and compacting are specified in Division 31 Section "Earthwork".
- B. Concrete requirements related to this work are specified in Division 32 Section "Site Concrete."

##### 1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firms regularly engaged in manufacturing of products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years. Products are limited to those of domestic manufacturers.
- B. Installer Qualifications: Firm with at least 3 years of successful installation experience on projects of similar scope.
- C. Codes and Standards: Comply with all applicable codes and requirements, including amendments and modifications by local jurisdictions, related to the performance of this work including, but not necessarily limited to the following:

International Building Code

International Plumbing Code

International Mechanical Code

American National Standards Institute (ANSI)

American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

Welding: Qualify Welding procedures, welders, and operators in accordance with ASME b31.1, or ASME B31.9 or ANSI and ASTM as applicable, for shop and project site welding of piping work.

Utah Safety Standards (OSHA), Utah State Industrial Council

##### 1.4 SUBMITTALS

- A. Product Data: Submit manufacturers' technical data and installation instructions for each type of material precast items and product furnished.
- B. Record Drawings: At project closeout, submit Record Drawings of installed utility service lines

in accordance with Division 1 Requirements.

## **1.5 PROJECT CONDITIONS**

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
  - 1. Notify Owner and Architect no fewer than two days in advance of proposed interruption of service.
  - 2. Do not proceed with interruption of service without Construction Manager's written permission.

## **PART 2 - PRODUCTS**

### **2.1 ONSITE STORM DRAINAGE SYSTEM COMPONENTS**

- A. For pipe 8" diameter or larger HDPE, Corrugated PE Pipe and Fittings AASHTO M 294, Type S, with smooth waterway for coupling joints.  
  
-Watertight Joints: Watertight joints in accordance with ASTM D 3212 and AASHTO M 252. Bell and spigot with gaskets, ASTM F477.
- B. For pipe 6" diameter or smaller, PVC Pipe: ASTM D - 3035 SDR 35, with bell and spigot type joints and elastomeric seals.
- C. All piping within the City ROW to be per city standards.

### **2.2 CATCH BASIN/CLEANOUT BOXES**

- 1. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
  - A. Designated Precast Concrete Catch Basins: ASTM C 913, precast, reinforced concrete; designed according to ASTM c 890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints.
    - 1. Joint Sealants: ASTM C 990, bitumen or butyl rubber.
    - 2. Grade Rings: Include 2 or 3 reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and grate.
    - 3. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
  - B. Cast-in-Place Concrete, catch Basins: Construct of reinforced concrete; designed according to ASTM C 890 for structural loading; of depth, shape, dimensions, and appurtenances indicated.
    - 1. Bottom Walls, and Top: Reinforced concrete.
    - 2. Channels and Benches: Concrete.
  - C. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A16. Structural loading. Include flat grate with small square or short-slotted drainage openings.
    - 1. Size: 24 by 24 inches minimum, unless otherwise indicated.
    - 2. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

## **PART 3 - EXECUTION**

### **3.1 GENERAL:**

- A. Excavate and backfill as specified in Section 312000.
- B. Locate lines as close as possible to those shown on Drawings.
- C. For sloped lines, grade to obtain fall required.
- D. Remove debris from trench prior to laying of pipe.
- E. Do not cut trenches near footings without consulting Architect.
- F. Backfill only after pipe lines have been inspected and approved by Architect.
- G. Failure to install joints properly shall be cause for rejection and replacement of piping system.

### **3.2 INSTALLATION OF STORM DRAINAGE SYSTEM**

- A. General: Backfill only after pipe lines have been inspected and approved by Architect.
- B. Install cleanout boxes to grade as indicated on plans. Provide concrete collar around new and existing boxes. Use 4,000 psi concrete collars around inlets and cleanout boxes to grade.
- C. Install materials in accordance with Manufacturer's instructions.
- D. Grout smooth with non-shrink grout all inlet box joints, piping connections or ledges.

### **3.3 FIELD QUALITY CONTROL**

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
  - 1. Submit separate reports for each system inspection.
  - 2. Defects requiring correction include the following:
    - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    - c. Crushed, broken, cracked, or otherwise damaged piping.
    - d. Infiltration: Water leakage into piping.
    - e. Exfiltration: Water leakage from or around piping.
  - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
  - 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
  - 1. Do not enclose, cover, or put into service before inspection and approval.
  - 2. Test completed piping systems according to authorities having jurisdiction.
  - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours advance notice.
  - 4. Submit separate report for each test.
- C. Leaks and loss in test pressure constitute defects that must be repaired.

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E. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

**3.4 CLEANING**

A. Clean interior of piping and storm drain boxes of dirt and superfluous materials.

**END OF SECTION**



**DIVISION 34 - 48**

Not Used