

HIGHLAND JUNIOR HIGH SCHOOL REMODEL

OGDEN SCHOOL DISTRICT

CONSTRUCTION DOCUMENTS

MHTN PROJECT NO. 2015505.00

15 APRIL 2015



vision made **real**

HIGHLAND JUNIOR HIGH SCHOOL REMODEL OGDEN SCHOOL DISTRICT

MHTN PROJECT NO 2015505.00

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15 APRIL 2015

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INVITATION TO BID

PROJECT: HIGHLAND JUNIOR HIGH SCHOOL REMODEL
325 GRAMERCY AVENUE
OGDEN UTAH

OWNER: OGDEN SCHOOL DISTRICT

ARCHITECT: MHTN ARCHITECTS, INC.
420 EAST SOUTH TEMPLE - SUITE 100
SALT LAKE CITY, UTAH 84111

BID RECEIPT APRIL 29 , 2015 2:00 pm MDST
ROOM 210
OGDEN SCHOOL DISTRICT
1950 MONROE BLVD.
OGDEN, UTAH 84401

Sealed Proposals will be received by the Ogden School District until time stated above, for all construction work to complete the above referenced project in accordance with the Contract Documents prepared by MHTN Architects, Inc.

Proposals will be received at the times stated above. Bids must be labeled "Highland Jr. High RFP5-007 Proposals received after the opening times stated will not be accepted.

Pre-bid walk-through will be held on-site April 22, 2015 at 11:30 AM

Proposals must conform and be responsive to all Documents.

The Ogden School District will take advantage of the tax-exempt law that became effective January 1, 1996. The vendors must use tax exempt form TC721G when purchasing construction materials for School District projects. A copy of form TC721G will be completed and signed by a District representative at time of award.

Proposal Documents will be available April 15, 2015

Bid security is required in the form of a certified check or cashier's check payable to the Owner, or a bid bond in favor of the Owner, executed by the bidder as principal and a satisfactory surety company as surety, in an amount not less than 5% of the maximum amount of the bid. Bid security shall be given as a guarantee that the proposer will execute the contract if it is awarded to him, in conformity with the Contract Documents.

The successful contractor must submit a performance and payment bond prior to commencement of the work.

Amounts withheld as retainage will be held in an interest bearing account

The Contractor and the contractor's surety shall be liable for and pay the Owner damages for each calendar day of delay until the work is substantially completed. The Project shall be substantially completed within the number of days indicated in the Project Manual.

No bidder may withdraw his proposal within a sixty day period after the bid opening.

The Owner reserves the right to reject any and all proposals, or to waive any irregularities or informalities in any proposal or in the proposal process.



AIA[®] Document A701[™] – 1997

Instructions to Bidders

for the following PROJECT:

(Name and location or address):

sample 1

THE OWNER:

(Name and address):

THE ARCHITECT:

(Name and address):

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ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Advertisement or Invitation to Bid, Instructions to Bidders, Supplementary Instructions to Bidders, the bid form, and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications and all Addenda issued prior to execution of the Contract.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201, or in other Contract Documents are applicable to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect prior to the execution of the Contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added or from which Work may be deleted for sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment or services or a portion of the Work as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 The Bidder by making a Bid represents that:

§ 2.1.1 The Bidder has read and understands the Bidding Documents or Contract Documents, to the extent that such documentation relates to the Work for which the Bid is submitted, and for other portions of the Project, if any, being bid concurrently or presently under construction.

§ 2.1.2 The Bid is made in compliance with the Bidding Documents.

§ 2.1.3 The Bidder has visited the site, become familiar with local conditions under which the Work is to be performed and has correlated the Bidder's personal observations with the requirements of the proposed Contract Documents.

§ 2.1.4 The Bid is based upon the materials, equipment and systems required by the Bidding Documents without exception.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 COPIES

§ 3.1.1 Bidders may obtain complete sets of the Bidding Documents from the issuing office designated in the Advertisement or Invitation to Bid in the number and for the deposit sum, if any, stated therein. The deposit will be refunded to Bidders who submit a bona fide Bid and return the Bidding Documents in good condition within ten days after receipt of Bids. The cost of replacement of missing or damaged documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the Bidding Documents and the Bidder's deposit will be refunded.

§ 3.1.2 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the Advertisement or Invitation to Bid, or in supplementary instructions to bidders.

§ 3.1.3 Bidders shall use complete sets of Bidding Documents in preparing Bids; neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

§ 3.1.4 The Owner and Architect may make copies of the Bidding Documents available on the above terms for the purpose of obtaining Bids on the Work. No license or grant of use is conferred by issuance of copies of the Bidding Documents.

§ 3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

§ 3.2.1 The Bidder shall carefully study and compare the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and local conditions, and shall at once report to the Architect errors, inconsistencies or ambiguities discovered.

§ 3.2.2 Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request which shall reach the Architect at least seven days prior to the date for receipt of Bids.

§ 3.2.3 Interpretations, corrections and changes of the Bidding Documents will be made by Addendum. Interpretations, corrections and changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon them.

§ 3.3 SUBSTITUTIONS

§ 3.3.1 The materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.

§ 3.3.2 No substitution will be considered prior to receipt of Bids unless written request for approval has been received by the Architect at least ten days prior to the date for receipt of Bids. Such requests shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment or other portions of the Work, including changes in the work of other contracts that incorporation of the proposed substitution would require, shall be included. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.3 If the Architect approves a proposed substitution prior to receipt of Bids, such approval will be set forth in an Addendum. Bidders shall not rely upon approvals made in any other manner.

§ 3.3.4 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.4 ADDENDA

§ 3.4.1 Addenda will be transmitted to all who are known by the issuing office to have received a complete set of Bidding Documents.

§ 3.4.2 Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.

§ 3.4.3 Addenda will be issued no later than four days prior to the date for receipt of Bids except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Each Bidder shall ascertain prior to submitting a Bid that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 PREPARATION OF BIDS

§ 4.1.1 Bids shall be submitted on the forms included with the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and figures. In case of discrepancy, the amount written in words shall govern.

§ 4.1.4 Interlineations, alterations and erasures must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change."

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall make no additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name of the Bidder and the nature of legal form of the Bidder. The Bidder shall provide evidence of legal authority to perform within the jurisdiction of the Work. Each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.

§ 4.2 BID SECURITY

§ 4.2.1 Each Bid shall be accompanied by a bid security in the form and amount required if so stipulated in the Instructions to Bidders. The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and will, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. The amount of the bid security shall not be forfeited to the Owner in the event the Owner fails to comply with Section 6.2.

§ 4.2.2 If a surety bond is required, it shall be written on AIA Document A310, Bid Bond, unless otherwise provided in the Bidding Documents, and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the power of attorney.

§ 4.2.3 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until either (a) the Contract has been executed and bonds, if required, have been furnished, or (b) the specified time has elapsed so that Bids may be withdrawn or (c) all Bids have been rejected.

§ 4.3 SUBMISSION OF BIDS

§ 4.3.1 All copies of the Bid, the bid security, if any, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.2 Bids shall be deposited at the designated location prior to the time and date for receipt of Bids. Bids received after the time and date for receipt of Bids will be returned unopened.

§ 4.3.3 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.4 Oral, telephonic, telegraphic, facsimile or other electronically transmitted bids will not be considered.

§ 4.4 MODIFICATION OR WITHDRAWAL OF BID

§ 4.4.1 A Bid may not be modified, withdrawn or canceled by the Bidder during the stipulated time period following the time and date designated for the receipt of Bids, and each Bidder so agrees in submitting a Bid.

§ 4.4.2 Prior to the time and date designated for receipt of Bids, a Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder. Written confirmation over the signature of the Bidder shall be received, and date- and time-stamped by the receiving party on or before the date and time set for receipt of Bids. A change shall be so worded as not to reveal the amount of the original Bid.

§ 4.4.3 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to Bidders.

§ 4.4.4 Bid security, if required, shall be in an amount sufficient for the Bid as resubmitted.

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 OPENING OF BIDS

At the discretion of the Owner, if stipulated in the Advertisement or Invitation to Bid, the properly identified Bids received on time will be publicly opened and will be read aloud. An abstract of the Bids may be made available to Bidders.

§ 5.2 REJECTION OF BIDS

The Owner shall have the right to reject any or all Bids. A Bid not accompanied by a required bid security or by other data required by the Bidding Documents, or a Bid which is in any way incomplete or irregular is subject to rejection.

§ 5.3 ACCEPTANCE OF BID (AWARD)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest qualified Bidder provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's own best interests.

§ 5.3.2 The Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the low Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 CONTRACTOR'S QUALIFICATION STATEMENT

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request, a properly executed AIA Document A305, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted as a prerequisite to the issuance of Bidding Documents.

§ 6.2 OWNER'S FINANCIAL CAPABILITY

The Owner shall, at the request of the Bidder to whom award of a Contract is under consideration and no later than seven days prior to the expiration of the time for withdrawal of Bids, furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. Unless such reasonable evidence is furnished, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 SUBMITTALS

§ 6.3.1 The Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, after notification of selection for the award of a Contract, furnish to the Owner through the Architect in writing:

- .1 a designation of the Work to be performed with the Bidder's own forces;
- .2 names of the manufacturers, products, and the suppliers of principal items or systems of materials and equipment proposed for the Work; and
- .3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder in writing if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, (1) withdraw the Bid or (2) submit an acceptable substitute person or entity with an adjustment in the Base Bid or Alternate Bid to cover the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 BOND REQUIREMENTS

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Bonds may be secured through the Bidder's usual sources.

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 If the Owner requires that bonds be secured from other than the Bidder's usual sources, changes in cost will be adjusted as provided in the Contract Documents.

§ 7.2 TIME OF DELIVERY AND FORM OF BONDS

§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to be commenced prior thereto in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond. Both bonds shall be written in the amount of the Contract Sum.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

ARTICLE 8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment Is a Stipulated Sum.

Additions and Deletions Report for

AIA[®] Document A701[™] – 1997

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 16:12:16 on 01/13/2009.

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sample 1

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, _____, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 16:12:16 on 01/13/2009 under Order No. 1000381962_1 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A701™ – 1997 - Instructions to Bidders, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

(Signed)

(Title)

(Dated)

CONTRACT FORMS & CONDITIONS

TO: OGDEN SCHOOL DISTRICT
ATTN: Ken Crawford – Director of Athletics and Support Services
1950 MONROE BLVD ROOM 210
Ogden, UT

PROJECT: HIGHLAND JUNIOR HIGH SCHOOL REMODEL

NAME OF PROPOSING FIRM: _____

PHONE: _____ **DATE:** _____

Gentlemen:

The undersigned, in compliance with the Bid documents, has examined the drawings, specifications, related documents, and the site of the proposed work and being familiar with all the conditions surrounding the construction of the proposed project, including the availability of labor, hereby propose to furnish all labor, materials and supplies as required for the Project in accordance with the Contract Documents as specified and within the time set forth and at the price stated below. This price is to cover all expenses incurred in performing the work required under the Contract Documents of which this proposal is a part.

ADDENDA:

I/We acknowledge receipt of the following addenda: ____/____/____/____/____/____

BID BOND:

Enclosed is 5%, as required, in the sum of _____ (Bond or Certified Funds)

BASE BID:

HIGHLAND JUNIOR HIGH SCHOOL REMODEL

BUILDING and ON-SITE WORK COST: For work shown on the drawings and described in the Project Manual including insurance, I/We agree to perform for the sum of:

_____ Dollars _
(\$ _____)

(In the case of discrepancy, written amount shall govern)

UNIT PRICES :

ITEM	DESCRIPTION	UNIT	UNIT COST
1.	Imported Engineered Structural Fill	Per Cubic Yard	\$ _____
2.	Mass Excavation	Per Cubic Yard	\$ _____
3.	Hand Excavation	Per Cubic Yard	\$ _____
4.	Haul Excavated Material	Per Cubic Yard	\$ _____
5.	Backfill	Per Cubic Yard	\$ _____
6.	Road Base	Per Cubic Yard	\$ _____
7.	3" Asphalt Paving	Per Square Foot	\$ _____
8.	Pedestrian Walkway	Per Square foot	\$ _____
9	8" Sanitary Sewer	Per Lin. Ft.	\$ _____
10.	24" Storm Drain Piping	Per Lin. Ft.	\$ _____
11.	15" Storm Drain Piping	Per Lin. Ft.	\$ _____
12.	10" Water Lines	Per Lin. Ft	\$ _____

13.	Trenching/Backfilling (0'-0" to 5'-0")	Per Cubic Yard	\$ _____
14.	Trenching/Backfilling (5'-0" to 10'-0")	Per Cubic Yard	\$ _____
15.	Imported Topsoil to match existing	Per Cubic Yard	\$ _____

COMPLETION DATE:

I/We guarantee to achieve Substantial Completion for this Project no later than _____ should I/We be the successful bidder.

Liquidated damages for the work are \$1,000.00 per calendar day.

This proposal shall remain good for sixty (60) days after Bid date. Unit prices shall remain in effect for a period of eighteen (18) months commencing with the Notice to Proceed.

Respondents are required to submit to the Ogden School District a copy of the State of Utah Contractor's License, including a statement of licensure limits. If respondent has requested an increase of monetary licensure limits, a copy of that request must be attached to the proposal at the time the proposal is submitted to the Weber School District.

PERFORMANCE AND PAYMENT BONDS:

Upon receipt of notice of acceptance of this proposal, the undersigned agrees to execute the contract within five (5) days and deliver Performance and Payment Bond in the prescribed form in the amount of 100% of the general construction contract price for faithful performance of the contract and payment of sub-contractors. The certified check, cashier's check or bid bond attached, in the amount not less than five percent (5%) of the above bid sum, shall become the property of Weber School District in the event that the contract is not negotiated and/or the Performance and Payment bond delivered within the time set forth, as liquidated damages for the delay and additional expense caused thereby.

Respectfully Submitted,

Firm Name SEAL (If a Corporation)

Authorized Signature

Printed Name and Title

Date

NOTARY

Subscribed and sworn before me this _____ day of _____ 2015.

Notary Public: _____

My Commission Expires: _____

Authorized Signature



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Document A310™ – 2010

Bid Bond

(Table deleted)

KNOW ALL MEN BY THESE PRESENTS, that we
(Here insert full name and address or legal title of Contractor)

as Principal, hereinafter called the Principal, and
(Here insert full name and address or legal title of Surety)

a corporation duly organized under the laws of the State of _____ as Surety, hereinafter
called the Surety, are held and firmly bound unto
(Here insert full name and address or legal title of Owner)

as Oblige, hereinafter called the Oblige, in the sum of (\$ _____), for the payment
of which sum well and truly to be made, the said Principal and the said Surety, bind
ourselves, our heirs, executors, administrators, successors and assigns, jointly and
severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for
(Here insert full name, address and description of project)

NOW, THEREFORE, if the Oblige shall accept the bid of the Principal and the
Principal shall enter into a Contract with the Oblige in accordance with the terms of
such bid, and give such bond or bonds as may be specified in the bidding or Contract
Documents with good and sufficient surety for the faithful performance of such Contract
and for the prompt payment of labor and material furnished in the prosecution thereof, or
in the event of the failure of the Principal to enter such Contract and give such bond or
bonds, if the Principal shall pay to the Oblige the difference not to exceed the penalty
hereof between the amount specified in said bid and such larger amount for which the
Oblige may in good faith contract with another party to perform the Work covered by
said bid, then this obligation shall be null and void, otherwise to remain in full force and
effect.

(Paragraphs deleted)

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

Signed and sealed this day of ,

(Witness)

(Witness)

(Principal) (Seal)

(Title)

(Surety)

(Title) (Seal)

Init.

/

Additions and Deletions Report for AIA[®] Document A310[™] – 2010

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

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PAGE 1

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

KNOW ALL MEN BY THESE PRESENTS, that we

~~OWNER:~~ *(Here insert full name and address or legal title of Contractor)*

~~(Name, legal status and address)~~ as Principal, hereinafter called the Principal, and
(Here insert full name and address or legal title of Surety)

...

BOND AMOUNT: \$

~~PROJECT:~~ a corporation duly organized under the laws of the State of _____ as Surety, hereinafter called the Surety,
are held and firmly bound unto
~~(Name, location or address, and Project number, if any)~~ *(Here insert full name and address or legal title of Owner)*

...

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their ~~as~~ Obligees, hereinafter called the Obligees, in the sum of _____ (\$ _____), for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, as ~~provided herein~~. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner firmly by these presents.

WHEREAS, the Principal has submitted a bid for
(Here insert full name, address and description of project)

NOW, THEREFORE, if the Obligees shall accept the bid of the Principal and the Principal shall enter into a Contract with the Obligees in accordance with the terms of such bid, and ~~gives give~~ such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, _____, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 11:16:17 on 09/18/2014 under Order No. 8147904523_1 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A310™ – 2010, Bid Bond, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

(Signed)

(Title)

(Dated)



AIA[®] Document A201[™] – 2007

General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

sample 1

THE OWNER:

(Name and address)

THE ARCHITECT:

(Name and address)

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1.5.2, 3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 11.4.1, 13.2, 13.4.2, 15.4.4.2

Written Interpretations

4.2.11, 4.2.12

Written Notice

2.3, 2.4, 3.3.1, 3.9, 3.12.9, 3.12.10, 5.2.1, 8.2.2, 9.7, 9.10, 10.2.2, 10.3, 11.1.3, 11.4.6, 12.2.2, 12.2.4, **13.3**, 14, 15.4.1

Written Orders

1.1.1, 2.3, 3.9, 7, 8.2.2, 11.4.9, 12.1, 12.2, 13.5.2, 14.3.1, 15.1.2



ARTICLE 1 GENERAL PROVISIONS

§ 1.1 BASIC DEFINITIONS

§ 1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding requirements.

§ 1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 THE WORK

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 THE PROJECT

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by separate contractors.

§ 1.1.5 THE DRAWINGS

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

§ 1.1.6 THE SPECIFICATIONS

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 INSTRUMENTS OF SERVICE

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 INITIAL DECISION MAKER

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2 and certify termination of the Agreement under Section 14.2.2.

§ 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 CAPITALIZATION

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 INTERPRETATION

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants.

§ 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

ARTICLE 2 OWNER

§ 2.1 GENERAL

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or

the portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.2 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.2.3 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.2.4 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.2.5 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.3 OWNER'S RIGHT TO STOP THE WORK

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

ARTICLE 3 CONTRACTOR

§ 3.1 GENERAL

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 LABOR AND MATERIALS

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other

facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work authorized by the Architect in accordance with Sections 3.12.8 or 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 WARRANTY

The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.6 TAXES

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 PERMITS, FEES, NOTICES, AND COMPLIANCE WITH LAWS

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume

the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 ALLOWANCES

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- .1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- .2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- .3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 SUPERINTENDENT

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the name and qualifications of a proposed superintendent. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect's approval. The Architect's approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 DOCUMENTS AND SAMPLES AT THE SITE

The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. Their purpose is to demonstrate the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such written notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be

required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.13 USE OF SITE

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 CUTTING AND PATCHING

§ 3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting and patching shall be restored to the condition existing prior to the cutting, fitting and patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

§ 3.15 CLEANING UP

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 ACCESS TO WORK

The Contractor shall provide the Owner and Architect access to the Work in preparation and progress wherever located.

§ 3.17 ROYALTIES, PATENTS AND COPYRIGHTS

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Architect. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

§ 3.18 INDEMNIFICATION

§ 3.18.1 To the fullest extent permitted by law the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 GENERAL

§ 4.1.1 The Owner shall retain an architect lawfully licensed to practice architecture or an entity lawfully practicing architecture in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 4.1.2 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Architect. Consent shall not be unreasonably withheld.

§ 4.1.3 If the employment of the Architect is terminated, the Owner shall employ a successor architect as to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 4.2 ADMINISTRATION OF THE CONTRACT

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate For Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 DEFINITIONS

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or (2) that the Architect requires additional time for review. Failure of the Owner or Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person or entity previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 SUBCONTRACTUAL RELATIONS

By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may

be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon such assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, 11 and 12.

§ 6.2 MUTUAL RESPONSIBILITY

§ 6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that

the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a separate contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a separate contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or separate contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 OWNER'S RIGHT TO CLEAN UP

If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 GENERAL

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

§ 7.2 CHANGE ORDERS

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor and Architect stating their agreement upon all of the following:

- .1 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 CONSTRUCTION CHANGE DIRECTIVES

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 As provided in Section 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.5 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.6 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

- .1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;
- .2 Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and
- .5 Additional costs of supervision and field office personnel directly attributable to the change.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 MINOR CHANGES IN THE WORK

The Architect has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.

ARTICLE 8 TIME

§ 8.1 DEFINITIONS

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 PROGRESS AND COMPLETION

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 DELAYS AND EXTENSIONS OF TIME

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 CONTRACT SUM

The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.2 SCHEDULE OF VALUES

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Architect, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2., for completed portions of the Work. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§ 9.4 CERTIFICATES FOR PAYMENT

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data comprising the Application for Payment, that, to the best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;

- .3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a separate contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.3 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or material or equipment suppliers to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Architect will reflect such payment on the next Certificate for Payment.

§ 9.6 PROGRESS PAYMENTS

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor no later than seven days after receipt of payment from the Owner the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and material and equipment suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor, except as may otherwise be required by law.

§ 9.6.5 Contractor payments to material and equipment suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors and suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.7 FAILURE OF PAYMENT

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' written notice to the Owner and Architect,

stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 SUBSTANTIAL COMPLETION

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 PARTIAL OCCUPANCY OR USE

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Section 11.3.1.5 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 FINAL COMPLETION AND FINAL PAYMENT

§ 9.10.1 Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the

Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- .1 liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents; or
- .3 terms of special warranties required by the Contract Documents.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 SAFETY PRECAUTIONS AND PROGRAMS

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 SAFETY OF PERSONS AND PROPERTY

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to

- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

§ 10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 INJURY OR DAMAGE TO PERSON OR PROPERTY

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 HAZARDOUS MATERIALS

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing.

§ 10.3.2 Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs of shut-down, delay and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall indemnify the Contractor for all cost and expense thereby incurred.

§ 10.4 EMERGENCIES

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 CONTRACTOR'S LIABILITY INSURANCE

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- .1 Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;
- .2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- .3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- .4 Claims for damages insured by usual personal injury liability coverage;
- .5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- .6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;
- .7 Claims for bodily injury or property damage arising out of completed operations; and
- .8 Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction

of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the Architect and the Architect's Consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 11.2 OWNER'S LIABILITY INSURANCE

The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

§ 11.3 PROPERTY INSURANCE

§ 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or

otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.2 BOILER AND MACHINERY INSURANCE

The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.3 LOSS OF USE INSURANCE

The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

§ 11.3.7 WAIVERS OF SUBROGATION

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the

Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

§ 11.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 UNCOVERING OF WORK

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

§ 12.2 CORRECTION OF WORK

§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 AFTER SUBSTANTIAL COMPLETION

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 ACCEPTANCE OF NONCONFORMING WORK

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 GOVERNING LAW

The Contract shall be governed by the law of the place where the Project is located except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 SUCCESSORS AND ASSIGNS

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to covenants, agreements and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

§ 13.3 WRITTEN NOTICE

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

§ 13.4 RIGHTS AND REMEDIES

§ 13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

§ 13.4.2 No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach there under, except as may be specifically agreed in writing.

§ 13.5 TESTS AND INSPECTIONS

§ 13.5.1 Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses shall be at the Contractor's expense.

§ 13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.5.5 If the Architect is to observe tests, inspections or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.6 INTEREST

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

§ 13.7 TIME LIMITS ON CLAIMS

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 TERMINATION BY THE CONTRACTOR

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency that requires all Work to be stopped;

- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 The Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work by the Owner as described in Section 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the above reasons exist, the Owner, upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- .1 that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 CLAIMS

§ 15.1.1 DEFINITION

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim.

§ 15.1.2 NOTICE OF CLAIMS

Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3 CONTINUING CONTRACT PERFORMANCE

Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4 CLAIMS FOR ADDITIONAL COST

If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.5.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 INITIAL DECISION

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 MEDIATION

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.6 shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 ARBITRATION

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 CONSOLIDATION OR JOINDER

§ 15.4.4.1 Either party, at its sole discretion, may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Either party, at its sole discretion, may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an

additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as the Owner and Contractor under this Agreement.



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Additions and Deletions Report for

AIA[®] Document A201[™] – 2007

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 09:35:25 on 03/31/2009.

PAGE 1

sample 1

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, _____, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 09:35:25 on 03/31/2009 under Order No. 1000381962_1 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A201™ – 2007 - General Conditions of the Contract for Construction, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

(Signed)

(Title)

(Dated)

SUPPLEMENTARY CONDITIONS

The following supplements modify the "General Conditions of the Contract for Construction," AIA Document A201, 2007 Edition. Where a portion of the General Conditions is modified or deleted by these Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect.

ARTICLE 1 - GENERAL PROVISIONS

1.1.1 THE CONTRACT DOCUMENTS revise to read:

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions) Drawings, Specifications, Addenda issued prior to execution of the Contract, the Contractor's Bid or Proposal, other documents listed in the Agreement and Modifications issued after execution of the Contract. A modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or Invitation to Bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, or portions of Addenda relating to bidding requirements.

1.1.8 INITIAL DECISION MAKER The Architect shall be identified in the Agreement to render initial Decisions on Claims in accordance with Section 15.2 and certify termination of the Agreement under Section 14.2.2

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

1.2.1.1 In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based upon the following priorities:

- .1 Modifications
- .2 The Agreement
- .3 Addenda with those of later date having precedence over those of earlier date.
- .4 The Supplementary Conditions
- .5 The General Conditions
- .6 Division 1 of the Specifications
- .7 Drawings and Divisions 2-49 of the Specifications
- .8 Other documents specifically enumerated in the Agreement as part of the Contract Documents.

In the case of conflicts or discrepancies between Drawings and Divisions used in this specification or within or among the Contract Documents and not clarified by Addendum, the Architect will determine which takes precedence in accordance with Section 4.2.11, 4.2.12, and 4.2.13.

1.2.2.1 Large scale drawings shall have precedence over small scale drawings in the same area or conditions and should any discrepancy occur between such large and small drawings the same shall be referred to the Architect for decision or clarification. Minor modifications of detailed drawings may be made in larger or full size drawings to clarify detail and to provide proper connection or construction at points not specifically detailed. Where a portion of the drawings or details is shown in outline, the portion shown in outline shall be constructed the same as like portions of work. If during the course of the contract, conflicts are found between the various parts of the drawings or between drawings and specifications, the Architect will interpret the drawings and/or specifications so as to secure the most substantial and complete performance of the work.

1.2.2.2 Certain materials and equipment are specified by manufacturer or trade name to establish standards of quality and performance and not for the purpose of limiting competition. Products of other manufacturers may be substituted, if, in the opinion of the Owner and the Architect, they are equal to those specified in quality, performance, design and suitability for intended use. Where two or more items are mentioned, the selection among those specified is the Contractor's option. Bids based on material and equipment other than those specified shall include a statement of substitutions stating difference in cost, if any, for each proposed substitution. Substitutions accepted prior to award of the Contract will be covered by modification to the original Contract Documents. Prior to consideration of any substitution, the Architect may require submission of samples, descriptive, technical and catalog data and reports of tests.

1.2.2.3 The drawings and specifications are complementary and that what is required by one shall be as binding as if required by all. Bidders are required to bid everything noted on both drawings and specifications. Should a discrepancy arise between the drawings and the specifications, the contractor will provide a price for the more restrictive of the discrepancies as a rule “

ARTICLE 2 - OWNER

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER:

2.2.5 The Contractor will be furnished, free of charge, a maximum of 15 copies of Drawings and Project Manuals to be used in this package. Additional sets will be furnished for the cost of reproduction and handling.

ARTICLE 3 - CONTRACTOR

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

3.2.5 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for evaluating and responding to the Contractor's requests for information that are not prepared in accordance with the Contract Documents or where the requested information is available to the contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared coordination drawings, or prior Project correspondence or documentation.

3.4 LABOR AND MATERIALS:

3.4.2.1 After the Contract has been executed, the Owner and Architect will consider a formal request for the substitution of products in place of those specified only under the conditions set forth in the General Requirements (Division 1 of the Specifications) . By making requests for substitutions, the contractor:

- .1 represents that it has personally investigated the proposed substitute product and determined that it is equal or superior in all aspects to that specified
- .2 represents that it will provide the same warranty for the substitution as it would have provided for the product specified.
- .3 certifies that the cost data presented is complete and includes all related costs for the substituted product and for Work that must be changed as a result of the substitution, except for the Architect's redesign costs and waives all claims for additional costs related to the substitution that subsequently becomes apparent; and
- .4 shall coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all aspects.

3.4.2.2 The Owner shall be entitled to reimbursement from the Contractor for amounts paid to the Architect for reviewing the Contractor's proposed substitutions and making agreed-upon changes in the Drawings and Specifications resulting from such substitutions.

3.4.4 The Contractor shall cooperate with the Architect in forwarding the interests of the Owner; he shall furnish efficient and skilled business administration and supervision during crucial periods along with an adequate supply of workmen and materials and complete the work in a thoroughly workmanlike and most expeditious manner to the satisfaction of the Architect and Owner.

3.6 TAXES Delete 3.6.1 and revise to read as follows

3.6.1 Purchases of construction materials by the Contractor is not subject to Utah State Sales Tax Use of Tax Exempt form TC-721g and authorization for such use shall be at the direction of the School District.

3.7 PERMITS, FEES AND NOTICES Delete 3.7.1 and revise to read as follows

3.7.1 All fees, impact fees, sewer charges, service deposits, will be paid by the Owner. Where inspections required by the Contract Documents and indicated to be by the Owner, require re-inspection, following the second inspection to comply with requirements, the Contractor will be charged \$200.00 per each additional inspection required until approval.

3.9 SUPERINTENDENT

3.9.4 The Superintendent is subject to the Approval of the Owner. Should the Owner request removal of the Superintendent during the course of the Work, a replacement superintendent , acceptable to the Owner shall be provided to permit the Project to proceed without delay.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- 3.12.5 add the following: Submittals which are not marked as reviewed for compliance with the Contract Documents and approved by the Contractor may be returned by the Architect without action.
- 3.12.11 The Architect's review of Contractor's submittals will be limited to examination of an initial submittal and one (1) re-submittal. The Owner is entitled to obtain reimbursement from the contractor for amounts paid to the Architect for evaluation of additional re-submittals.

ARTICLE 4 - ARCHITECT

4.2 ADMINISTRATION OF THE CONTRACT

- 4.2.2.1 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for site visits made necessary by the fault of the Contractor or by defects or deficiencies in the Work.

4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

- 4.2.7.1 In no case will the Architect's review period on any submittal be less than 10 days after receipt of the submittal from the Contractor.
- 4.2.14.1 Contractor's requests for information shall be prepared and submitted in accordance with Division 1 "General Requirements" sections on the form included in the Contract Documents, on AIA Document G716-2004, or Contractor's form of similar format, if acceptable to Architect. The Architect will return without action requests for information that do not conform to requirements of the Contract Documents.

ARTICLE 7 - CHANGES IN THE WORK

- 7.1.4 The allowance for the combined overhead and profit and related bond costs, included in the total cost to the Owner shall be limited to the following schedule:
- .1 For any work performed, the total amount of mark-up is limited to 10 percent including mark-up by General contractor and any subcontractors involved in the work change.
 - .2 Cost to which overhead and profit is to be applied shall be determined in accordance with Subparagraph 7.3.7 except 7.3.7.5 is revised to read:
 - a Additional costs of supervision and field office personnel, and processing of documentation of the change is considered to be part of general conditions and is not attributable to the change.
 6. In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials and Subcontracts. Labor and materials shall be

itemized in the manner prescribed above. Where major cost items are Subcontracts, they shall be itemized also.

ARTICLE 9 - PAYMENTS AND COMPLETION

9.3 APPLICATIONS FOR PAYMENT:

Add the following sentence to Section 9.3.1:

The form for Application for Payment, duly notarized, shall be a current authorized edition of the AIA Document G702-1992, Application and Certificate for Payment, supported by a current authorized edition of AIA Document

9.3.1.3 Payments made shall be 90 percent of scheduled values requested by each application for payment. Retainage shall be 10 percent and shall be withheld until final application for payment upon completion of the work. Retainage shall be held in an interest bearing account and distributed upon disbursement on a pro rata basis among all sub-contractors .

9.8 SUBSTANTIAL COMPLETION

9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. The following items, including, but not limited to, completed in their entirety, shall qualify the Work for SUBSTANTIAL COMPLETION:

1. Completion of all scheduled finishes: flooring, ceilings, interior architectural woodwork, (finish wall, ceiling and floor coatings), acoustical treatments, visual display boards, partitions & accessories.
2. Completion of all doors and door hardware, functioning as scheduled.
3. Completion of all roof systems
4. Completion of all window systems
5. Completion of all door access controls and door control devices.
6. Completion of all A/V, data & phones systems.
7. Completion of all light fixtures & day lighting control systems.
8. Completion of all exterior light fixtures
9. Completion of all fire & smoke alarm systems
10. Completion of all automatic sprinkler system.
11. Completion of complete mechanical system, mechanical controls system online & completed testing and balancing report.
12. Completion of all mechanical and plumbing fixtures, connected and functioning.
13. Completion of all exterior walkway, drive & parking systems and all associated drainage systems
14. Completion of all landscaping and irrigation systems
15. Completion of all exterior accessories and equipment (benches, trash receptacles, exterior sports equipment, chain link fences, ornamental metal fences and gates)

9.8.3.1 The Architect will perform no more than Two (2) inspections to determine whether the work or a designated portion thereof has attained Substantial Completion in accordance with the Contract Documents.

The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for additional inspections.

9.10 FINAL COMPLETION AND FINAL PAYMENT

9.10.1.1 The Architect will perform no more than Two (- 2 -) inspections to determine whether the work or a designated portion thereof has attained Final Completion in accordance with the Contract Documents. The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for additional inspections.

9.11 DAMAGES

9.11.1 The Contractor and the Contractor's surety shall be liable for and shall pay the Owner the sums hereinafter stipulated as liquidated damages, and not as a penalty, for each calendar day of delay after the date established for Substantial Completion in the Contract Documents until the work is substantially complete, including all punch list items: \$1000 dollars (\$1,000.00) per day.

ARTICLE 10 – PROTECTION OF PERSONS AND PROPERTY

10.2 SAFETY OF PERSONS AND PROPERTY

10.2.8 The Contractor shall keep areas affected by the work or adjacent to the site free from snow, ice, rubbish, excavation, encumbrances or any obstacles resulting from the construction operations, and in safe condition to the reasonable satisfaction of the authorities having jurisdiction.

10.2.9 The Contractor shall at all times provide protection against weather, rain, winds, storms, frost or heat, so as to maintain all work, materials, apparatus and fixtures, free from injury or damage. At the end of the day's work, all new work reasonably likely to be damaged shall be covered.

10.2.10 Adequate precautions shall be taken against fire throughout all the Contractor's operations. The amount of inflammable material shall be reduced to a minimum consistent with the proper handling and storing of materials. Except as otherwise provided herein, the Contractor shall not permit fires to be built or open salamanders to be used in any part of the work.

10.2.11 The Contractor shall provide at the site, and make available to all workmen, medical supplies and equipment necessary to supply first aid service to all persons who may be injured in connection with the work.

10.2.12 The Contractor shall provide the Architect with a copy of all reports of accidents and claims arising out of or in connection with the performance of the work. He shall immediately notify the Architect of accidental death, major injury to persons, and extensive damage to the work. If any claim is made by anyone against the Contractor or any subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the Architect, giving full details of the claim.

ARTICLE 11 - INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

11.1.1.1 Delete semicolon at end of Section 11.1.1.1 and add:

Including private entities performing Work at the site and exempt from the coverage on account of number of employees or occupation , which entities shall maintain voluntary compensation coverage at the same limits specified for mandatory coverage for the duration of the Project.

11.1.1.2 delete semicolon at end of Section 11.1.1.2 and add:

or persons or entities excluded by statute from the requirements of Section 11.1.1.1 but required by the Contract Documents to provide the insurance required by that section.

11.1.2.1 The limits for Workers Compensation and Employers Liability Insurance shall meet statutory limits mandated by State and Federal Laws. If (1) limits in excess of those required by statute are to be provided, (2) the employer is not statutorily bound to obtain such insurance coverage, or (3) additional coverages are required, additional coverages and limits for such insurance shall be as follows:

11.1.2.2 the limits for Commercial General Liability insurance including coverage for Premises-operations, independent Contractors' Protective, Products-Completed Operations, Contractual Liability, Personal Injury and Broad Form Property Damage (including coverage for Explosion, Collapse and underground Hazards) shall be as follows:

\$ 1,000,000 Each Occurrence

\$ 2,000,000 General Aggregate

\$ 1,000,000 Personal and Advertising Injury

\$ 2,000,000 Products Completed operations Aggregate

.1 The policy shall be endorsed to have the General Aggregate apply to this Project only

.2 The contractual Liability Insurance shall include coverage sufficient to meet the obligations in AIA Document A201-2007 under Section 3.18

.3 Products and Completed Operations insurance shall be maintained for a minimum period of at least ONE (-1-) year after the expiration of the period for correction of the Work.

11.1.2.3 Automobile Liability insurance (owned, non-owned and hired vehicles) for bodily injury and property damage \$ 1,000,000 Each Accident

11.1.2.4 Umbrella or Excess Liability Coverage: \$5,000,000

Reference is made to Paragraph 3.18, Indemnification, of AIA Document A201.

11.1.3 Add the following:

If this insurance is written on a Comprehensive General Liability policy form, the certificate shall be ACORD form 25-S completed and supplemented in accordance with AIA Document G715-1991, Instruction Sheet and Supplemental Attachment for ACORD Certificate of Insurance 25-S

Specifically set forth evidence of all coverage required by Subparagraphs 11.1.1 and 11.1.2. Furnish to the Owner copies of any endorsements that are subsequently issued amending coverage or limits.

11.1.3.1 Coverage on a claims-made basis will not be acceptable.

11.2 OWNER'S LIABILITY INSURANCE

11.2.1.1 The Owner shall provide insurance available through the Utah State Risk Management.

11.3 PROPERTY INSURANCE

11.3.1 Add the following: Insurance shall be provided through Utah State Risk Management unless otherwise indicated by the Owner.

11.3.1.6 The insurance required by Section 11.3 is not intended to cover machinery, tools or equipment owned or rented by the Contractor that are utilized in the performance of the Work but not incorporated into the permanent improvements. The Contractor shall, at the Contractor's own expense, provide insurance coverage for owned or rented machinery, tools or equipment, which shall be subject to the provisions of Section 11.3.7

11.4 PERFORMANCE BOND AND PAYMENT BOND

11.4.1 The Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder. Bonds may be obtained through the Contractor's usual source and the cost thereof shall be included in the Contract Sum. The amount of each bond shall be equal to 100 percent of the Contract Sum

11.4.1.1 The contractor shall deliver the required bonds to the Owner not later than three days following the date the Agreement is entered into, or if the work is to be commenced prior thereto in response to the letter of intent, the Contractor shall, prior to the commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished.

11.4.1.2 The contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

ARTICLE 12 – UNCOVERING AND CORRECTION OF WORK

12.2 CORRECTION OF WORK

12.2.2.4 Upon request by the Owner and prior to the expiration of one year from the date of Substantial Completion, the Architect will conduct and the Contractor shall attend a meeting with the Owner to review the facility operations and performance

ARTICLE 13 – MISCELLANEOUS PROVISIONS

13.8 EQUAL OPPORTUNITY

13.8.1 The Contractor shall maintain policies of employment as follows:

13.8.1.1 The Contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, or national origin. The Contractor shall take affirmative action to insure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex or national origin. Such action shall include, but are not limited to, the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.

13.8.1.2 The Contractor and Contractor's Subcontractors shall, in all solicitations or advertisement for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex or national origin.

ARTICLE 15 CLAIMS AND DISPUTES

15.1.5 CLAIMS FOR ADDITIONAL TIME

15.1.5.3 Claims for increase in the contract time shall set forth in detail the circumstances that form the basis for the Claim, the date upon which each cause of delay began to affect the progress of the Work, the date upon which each cause of delay ceased to affect the progress of the Work and the number of days' increase in the Contract Time claimed as a consequence of each such cause of delay. The contractor shall provide such supporting documentation as the Owner may reasonably require including, where appropriate, a revised construction schedule indicating all the activities affected by the circumstances forming the basis of the Claim.

15.1.5.4 The contractor shall not be entitled to a separate increase in the Contract Time for each one of the number of causes of delay which may have concurrent or interrelated effects on the progress of the Work, or for concurrent delays due to the fault of the Contractor.

END OF SUPPLEMENTARY CONDITIONS

**AIA®**

Document A312™ – 2010

Performance Bond

CONTRACTOR:*(Name, legal status and address)***SURETY:***(Name, legal status and principal place of business)***OWNER:***(Name, legal status and address)***CONSTRUCTION CONTRACT**

Date:

Amount: \$

Description:

*(Name and location)***BOND**

Date:

(Not earlier than Construction Contract Date)

Amount: \$

Modifications to this Bond: ☐ None ☐ See Section 16**CONTRACTOR AS PRINCIPAL**Company: *(Corporate Seal)***SURETY**Company: *(Corporate Seal)*

Signature: _____

Name and

Title:

(Any additional signatures appear on the last page of this Performance Bond.)

Signature: _____

Name and

Title:

*(FOR INFORMATION ONLY — Name, address and telephone)***AGENT or BROKER:****OWNER'S REPRESENTATIVE:***(Architect, Engineer or other party:)***ADDITIONS AND DELETIONS:**

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

- .1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;
- .2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
- .3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

- .1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
- .2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

- .1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
- .2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and
- .3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 **Balance of the Contract Price.** The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 **Construction Contract.** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 **Contractor Default.** Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 **Owner Default.** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 **Contract Documents.** All the documents that comprise the agreement between the Owner and Contractor.

§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL

Company: _____
(Corporate Seal)

Signature: _____
Name and Title: _____
Address: _____

SURETY

Company: _____
(Corporate Seal)

Signature: _____
Name and Title: _____
Address: _____

Additions and Deletions Report for **AIA[®] Document A312[™] – 2010**

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 11:46:47 on 09/18/2014.

There are no differences.

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, _____, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 11:46:47 on 09/18/2014 under Order No. 8147904523_1 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A312™ – 2010, Performance Bond, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

(Signed)

(Title)

(Dated)

**AIA®**

Document A312™ – 2010

Payment Bond

CONTRACTOR:*(Name, legal status and address)***SURETY:***(Name, legal status and principal place of business)***OWNER:***(Name, legal status and address)***CONSTRUCTION CONTRACT**

Date:

Amount: \$

Description:

*(Name and location)***BOND**

Date:

(Not earlier than Construction Contract Date)

Amount: \$

Modifications to this Bond: ☐ None ☐ See Section 18**CONTRACTOR AS PRINCIPAL**Company: *(Corporate Seal)***SURETY**Company: *(Corporate Seal)*

Signature: _____

Name and

Title:

(Any additional signatures appear on the last page of this Payment Bond.)

Signature: _____

Name and

Title:

*(FOR INFORMATION ONLY — Name, address and telephone)***AGENT or BROKER:****OWNER'S REPRESENTATIVE:***(Architect, Engineer or other party:)***ADDITIONS AND DELETIONS:**

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

- .1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
- .2 have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- .1 the name of the Claimant;
- .2 the name of the person for whom the labor was done, or materials or equipment furnished;
- .3 a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- .4 a brief description of the labor, materials or equipment furnished;
- .5 the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- .6 the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- .7 the total amount of previous payments received by the Claimant; and
- .8 the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL

Company: _____ (Corporate Seal)

Signature: _____
Name and Title: _____
Address: _____

SURETY

Company: _____ (Corporate Seal)

Signature: _____
Name and Title: _____
Address: _____

Additions and Deletions Report for ***AIA[®] Document A312[™] – 2010***

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 11:44:14 on 09/18/2014.

There are no differences.

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, _____, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 11:44:14 on 09/18/2014 under Order No. 8147904523_1 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A312™ – 2010, Payment Bond, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

(Signed)

(Title)

(Dated)

Application and Certificate for Payment

TO OWNER: FROM CONTRACTOR:	PROJECT: sample 1 VIA ARCHITECT:	APPLICATION NO: 001 PERIOD TO: CONTRACT FOR: General Construction CONTRACT DATE: PROJECT NOS: / /	Distribution to: OWNER: <input type="checkbox"/> ARCHITECT: <input type="checkbox"/> CONTRACTOR: <input type="checkbox"/> FIELD: <input type="checkbox"/> OTHER: <input type="checkbox"/>
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CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract. Continuation Sheet, AIA Document G703, is attached.

1. ORIGINAL CONTRACT SUM	\$ 0.00
2. Net change by Change Orders	\$ 0.00
3. CONTRACT SUM TO DATE (Line 1 ± 2)	\$ 0.00
4. TOTAL COMPLETED & STORED TO DATE (Column G on G703)	\$ 0.00
5. RETAINAGE:	
a. 0 % of Completed Work (Column D + E on G703)	\$ 0.00
b. 0 % of Stored Material (Column F on G703)	\$ 0.00
Total Retainage (Lines 5a + 5b or Total in Column I of G703)	\$ 0.00
6. TOTAL EARNED LESS RETAINAGE	\$ 0.00
(Line 4 Less Line 5 Total)	
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT	\$ 0.00
(Line 6 from prior Certificate)	
8. CURRENT PAYMENT DUE	\$ 0.00
9. BALANCE TO FINISH, INCLUDING RETAINAGE	
(Line 3 less Line 6)	\$ 0.00

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	\$ 0.00	\$ 0.00
Total approved this Month	\$ 0.00	\$ 0.00
TOTALS	\$ 0.00	\$ 0.00
NET CHANGES by Change Order	\$	0.00

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

State of: _____

County of: _____

Subscribed and sworn to before
me this _____ day of _____

Notary Public:

My Commission expires: _____

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED \$ 0.00

(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

ARCHITECT:

By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract

Continuation Sheet

AIA Document G702, APPLICATION AND CERTIFICATION FOR PAYMENT, containing Contractor's signed certification is attached.

In tabulations below, amounts are stated to the nearest dollar.

Use Column I on Contracts where variable retainage for line items may apply.


APPLICATION NO: 001

APPLICATION DATE:

PERIOD TO:

ARCHITECT'S PROJECT NO:

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	%(G ÷ C)	BALANCE TO FINISH (C - G)	RETAINAGE (IF VARIABLE RATE)
			FROM PREVIOUS APPLICATION (D + E)	THIS PERIOD					
	GRAND TOTAL	\$ 0.00	\$ 0.00	\$ 0.00	\$ 0.00	\$ 0.00	0.00 %	\$ 0.00	\$ 0.00

	Utah State Tax Commission Exemption Certificate for Governments & Schools (Sales, Use, Tourism and Motor Vehicle Rental Tax)		TC-721G Rev. 12/08

Name of institution claiming exemption (purchaser)		Telephone Number	
Street Address	City	State	ZIP Code
Authorized Signature	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 similar indirect payments.

☐ **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 similar indirect payments. **CAUTION:** This exemption does not apply to government or educational entities of other 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.

TECHNICAL SPECIFICATIONS

SECTION 011000 - SUMMARY

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 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: Project consists of remodeling of selected areas of Highland Junior High School for the Ogden School District.
- B. Architect Identification: The Contract Documents were prepared for the Project by MHTN Architects, 420 East South Temple, Salt Lake City, Utah 84111

1.3 CONTRACTS

- A. Project will be constructed under a construction management contract, with subcontractors and suppliers under contract to the Construction Manager

1.4 CONSTRUCTION SCHEDULE – MANPOWER REQUIREMENTS

- A. Contractors shall provide adequate personnel and extend workdays and work weeks to comply with the schedule requirements of this project.

Construction Start June 1, 2015

Substantial Completion August 31, 2015 for Owners beneficial use.

Final Completion October 1, 2015

1.5 USE OF PREMISES

- A. General: The Contractor shall have limited use of the construction area for operations. The Contractor's use of premises is limited only by the educational function required for administrative operations and schooling on a limited basis in the adjacent facilities to remain. Coordination with school arrival and departure will be required to coordinate deliveries, storage areas,

1.6 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the NEW-division format and CSI/CSC's "MasterFormat" numbering system.
 - 1. 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.

- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. 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.
 2. 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.
 - a. 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not used)

END OF SECTION 011000

SECTION 012200 - UNIT PRICES

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 unit prices.
- B. Related Sections include the following:
 - 1. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
 - 2. Division 1 Section "Quality Requirements" for general testing and inspecting requirements.

1.3 DEFINITIONS

- A. Unit price is **an amount proposed by bidders, stated on the Bid Form, as** a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, overhead, and profit.
- B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A list of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

1. Imported Engineered Structural Fill	Per Cubic Yard	\$ _____
2. Mass Excavation	Per Cubic Yard	\$ _____
3. Hand Excavation	Per Cubic Yard	\$ _____
4. Haul Excavated Material	Per Cubic Yard	\$ _____
5. Backfill	Per Cubic Yard	\$ _____
6. Road Base	Per Cubic Yard	\$ _____
7. Asphalt Paving	Per Cubic Yard	\$ _____
8. Pedestrian Walkway	Per Cubic Yard	\$ _____
9. 8" Sanitary Sewer	Per Cubic Yard	\$ _____
10. 24" Storm Drain Piping	Per Cubic Yard	\$ _____
11. 15" Storm Drain Piping	Per Cubic Yard	\$ _____
12. 10" Water Lines	Per Cubic Yard	\$ _____
13. Trenching/Backfilling (0'-0" to 5'-0")	Per Cubic Yard	\$ _____
14. Trenching/Backfilling (5'-0" to 10'-0")	Per Cubic Yard	\$ _____

END OF SECTION 012200

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Sections:
 - 1. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
 - 2. Divisions 02 through 49 Sections for specific requirements and limitations for substitutions.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 SUBMITTALS

- A. 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 product or fabrication or installation cannot be provided, if applicable.
 - 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, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section.

Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

- d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
 - j. 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 date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - m. 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 seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

- A. Coordination: Modify or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
1. 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:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.
 - h. 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.
- B. Substitutions for Convenience: 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.
1. 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:
 - a. 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.
 - b. Requested substitution does not require extensive revisions to the Contract Documents.
 - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - d. Substitution request is fully documented and properly submitted.
 - e. Requested substitution will not adversely affect Contractor's construction schedule.
 - f. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - g. Requested substitution is compatible with other portions of the Work.
 - h. Requested substitution has been coordinated with other portions of the Work.
 - i. Requested substitution provides specified warranty.
 - j. 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.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500



MHTN
ARCHITECTS

SUBSTITUTION
REQUEST
(During the Bidding Phase)

Project: _____ Substitution Request Number: _____
To: _____ From: _____
Re: _____ Date: _____
A/E Project Number: _____
Contract For: _____

Specification Title: _____ Description: _____
Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____
Manufacturer: _____ Address: _____ Phone: _____
Trade Name: _____ Model No.: _____

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- ☐ Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- ☐ Same warranty will be furnished for proposed substitution as for specified product.
- ☐ Same maintenance service and source of replacement parts, as applicable, is available.
- ☐ Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule..
- ☐ Proposed substitution does not affect dimensions and functional clearances.
- ☐ Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted by: _____
Signed by: _____
Firm: _____
Address: _____
Telephone: _____

A/E's REVIEW AND ACTION

- ☐ Substitution approved - Make submittals in accordance with Specification Section 013300.
- ☐ Substitution approved as noted - Make submittals in accordance with Specification Section 013300.
- ☐ Substitution rejected - Use specified materials.
- ☐ Substitution Request received too late - Use specified materials.

Signed by: _____ Date: _____

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General 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.

1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue a field order 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 **7 days** 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.
 - 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, the Construction Manager will issue a Change Authorization for signatures of Owner and Contractor.

1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Owner may issue a Construction Change Directive on AIA Document G714. 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 012600

SECTION 012900 - 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. Division 1 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 2. Division 1 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

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:
 - a. Application for Payment forms with Continuation Sheets.
 - b. Submittals Schedule.
 - 2. 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.
 - 3. Subschedules: Where the Work is separated into phases requiring separately phased payments, provide subschedules 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. Allowances (if required): Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
8. 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.
9. 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. 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** or Owner's required forms 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 2 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. 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 (if any)
 - 6. Submittals Schedule (preliminary if not final).
 - 7. List of Contractor's staff assignments.
 - 8. Copies of building permits.
 - 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 - 10. Initial progress report.
 - 11. Report of preconstruction conference.
 - 12. Certificates of insurance and insurance policies.
 - 13. Performance and payment bonds.
 - 14. Data needed to acquire Owner's insurance.
 - 15. Initial settlement survey and damage report if required.
- G. 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.
- H. 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, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used) –

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - 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. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Summary" for a description of the Work and responsibility for coordination activities not in this Section.
 - 2. Division 1 Section "Construction Progress Documentation" for preparing and submitting the Contractor's Construction Schedule.
 - 3. Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 4. Division 1 Section "Closeout Procedures" for coordinating Contract closeout.

1.3 COORDINATION

- A. Coordination: Contractor shall coordinate its construction operations with those of other contractors in separate phases where required, and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations of other contractors under this contract or others, 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. 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. 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 26 Section "Basic Electrical Materials and Methods" for specific Coordination Drawing requirements for electrical installations.
- B. Staff Names. Within 5 days of starting construction operations, submit a list of the principal staff assignments, including superintendent and other personnel in attendance at Project site. 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.

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 sub-contractors.

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, a minimum of 1 week in advance 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: The Architect will record significant discussions and agreements achieved and distribute the meeting minutes to everyone concerned, including Owner and Contractor, within 2 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 unless otherwise directed by Owner. Hold the conference at Project site. 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.
 - 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. Site Upkeep.
 - r. Working hours.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before construction activities that requires coordination with other construction as a part of weekly progress meetings.
 - 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related Change Orders.
 - d. Purchases.
 - e. Deliveries.
 - f. Submittals.
 - g. Review of mockups.
 - h. Possible conflicts.
 - i. Compatibility problems.
 - j. Time schedules.
 - k. Weather limitations.
 - l. Manufacturer's written recommendations.
 - m. Warranty requirements.
 - n. Compatibility of materials.
 - o. Acceptability of substrates.
 - p. Temporary facilities and controls.
 - q. Space and access limitations.
 - r. Regulations of authorities having jurisdiction.
 - s. Testing and inspecting requirements.
 - t. Required performance results.
 - u. Protection of construction and personnel.
 3. Record significant conference discussions, agreements, and disagreements.
 4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress and coordination meetings at intervals as directed by the Construction Manager. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Owner and Architect, each 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: The Architect will prepare meeting minutes and distribute to each party present and to parties who should have been present.
 - 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

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 documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's Construction Schedule.
 - 2. Submittals Schedule.
 - 3. Daily construction reports.
 - 4. Field condition reports.
 - 5. Special reports.
- B. Related Sections include the following:
 - 1. Division 1 Section "Payment Procedures" for submitting the Schedule of Values.
 - 2. Division 1 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
 - 3. Division 1 Section "Submittal Procedures" for submitting schedules and reports.
 - 4. Division 1 Section "Quality Requirements" for submitting a schedule of tests and inspections.
 - 5. Division 1 Section "Closeout Procedures" for submitting Project Record Documents at Project closeout.

1.3 SUBMITTALS

- A. All Submittals are required to be in full compliance with all Building codes in force – Submission guarantees that submittal is compliant at time of submittal.
- B. Submittals Schedule: Submit **three** copies of schedule within 30 days of Notice to Proceed. Arrange the following information in a tabular format:
 - 1. Scheduled date for first submittal.
 - 2. Specification Section number and title.
 - 3. Submittal category (action or informational).
 - 4. Name of subcontractor.
 - 5. Description of the Work covered.
 - 6. Scheduled date for Architect's and Construction Manager's final release or approval.
- C. Contractor's Construction Schedule: Submit **two** opaque copies of initial schedule, large enough to show entire schedule for entire construction period. Submit prior to or at the same time as the first Application for Payment.
- D. Daily Construction Reports: Submit one copy at **weekly** intervals.

- E. Field Condition Reports: Submit one copy at time of discovery of differing conditions.
- F. Special Reports: Submit one copy at time of unusual event.

1.4 QUALITY ASSURANCE

- A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:
 - 1. Discuss constraints, including **phasing and storage areas**.
 - 2. Review time required for review of submittals and resubmittals.
 - 3. Review requirements for tests and inspections by independent testing and inspecting agencies, if required
 - 4. Review time required for completion and startup procedures.
 - 5. Review and finalize list of construction activities to be included in schedule.
 - 6. Review submittal requirements and procedures.
 - 7. Review procedures for updating schedule.

1.5 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work including delivery of equipment from parties involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
 - 1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
 - 2. Initial Submittal: Include critical submittals required as soon as possible following commencement of the work. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 - 3. Final Submittal: Submit as soon as possible to permit utilization by the Project Team.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
- B. Time Frame: Extend schedule from date established for **commencement of the Work or the Notice to Proceed** to date of **Substantial Completion**.
- C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
 - 1. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 30 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 2. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
 - 3. Startup and Testing Time: Include days for startup and testing as required by the Electrical Consultant.
 - 4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
 - 5. Commissioning: Indicate time for systems commissioning as specified in Division 23 sections.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 - 1. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Uninterruptible services.
 - c. Use of premises restrictions including coordination with the Owner to restrict dust and noise.
 - d. Provisions for future construction.
 - e. Environmental control.
 - 2. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards, if any.
 - b. Submittals.
 - c. Purchases.
 - d. Fabrication.
 - e. Sample testing.
 - f. Deliveries.
 - g. Installation.
 - h. Tests and inspections.
 - i. Adjusting.
 - j. Startup and placement into final use and operation.

- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, Percentage completion milestones and Final Completion.
- F. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis to demonstrate the effect of the proposed change on the overall project schedule.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. CPM Schedule: Prepare Contractor's Construction Schedule using a CPM network analysis diagram.
 - 1. Develop network diagram to submit with the Response to the Request for Proposal.
 - 2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 - 3. Use "one workday" as the unit of time.
- C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Prepare a skeleton network to identify probable critical paths.
 - 1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Purchase of materials.
 - c. Delivery.
 - d. Fabrication.
 - e. Installation.
 - 2. Processing: Process data to produce output data or a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 - 3. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- D. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
 - 1. Contractor or subcontractor and the Work or activity.
 - 2. Description of activity.
 - 3. Principal events of activity.
 - 4. Immediate preceding and succeeding activities.
 - 5. Early and late start dates.
 - 6. Early and late finish dates.
 - 7. Activity duration in workdays.
 - 8. Total float or slack time.
 - 9. Average size of workforce.

10. Dollar value of activity (coordinated with the Schedule of Values).
- E. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations in workdays.
 5. Changes in the critical path.
 6. Changes in total float or slack time.
 7. Changes in the Contract Time.
- F. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
 2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
 3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
 4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
 - a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
 - b. Submit value summary printouts **one week** before each regularly scheduled progress meeting.

2.4 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site(s), if any.
 2. List of separate contractors at Project site where applicable
 3. Approximate count of personnel at Project site.
 4. High and low temperatures and general weather conditions.
 5. Accidents.
 6. Meetings and significant decisions.
 7. Unusual events (refer to special reports).
 8. Stoppages, delays, shortages, and losses.
 9. Emergency procedures.
 10. Orders and requests of authorities having jurisdiction.
 11. Change Orders received and implemented.
 12. Construction Change Directives received.
 13. Services connected and disconnected.
 14. Equipment or system tests and startups.
 15. Partial Completions.
 16. Substantial Completions.
- B. 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. In-

clude a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 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.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At weekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one day before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect, Owner, sub-contractors, testing and inspecting agencies, if applicable and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules 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 performance of construction activities.

END OF SECTION 013200

SECTION 013300 - SUBMITTAL 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 and Submittal Schedule for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals in electronic format.
- B. Related Sections include the following:
 - 1. Division 1 Section "Payment Procedures" for submitting Applications for Payment.
 - 2. Division 1 Section "Project Management and Coordination" for submitting Coordination Drawings.
 - 3. Division 1 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule
 - 4. Division 1 Section "Quality Requirements" for submitting test and inspection reports and Delegated-Design Submittals.
 - 5. Division 1 Section "Closeout Procedures" for submitting warranties Project Record Documents and operation and maintenance manuals.
 - 6. Division 01 Section "Sustainable Design Requirements" for related submittals.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's approval. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL SCHEDULE

- A. Submittals Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule and within times specified herein. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
 - 1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
 - 2. Initial Submittal: Include critical submittals required as soon as possible following commencement of the work. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

- B. Submit schedule in PDF format in a timely manner following Notice to Proceed with sufficient time allowed for review, subsequent transmittal and ordering of required products for fabrication, delivery and installation. Arrange the following information in a tabular format:
1. Scheduled date for first submittal.
 2. Specification Section number and title.
 3. Submittal category (action or informational).
 4. Name of subcontractor.
 5. Description of the Work covered.
 6. Scheduled date for Architect's and Contractor's final release or approval.

1.5 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. **Architect reserves** the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. 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 21 business days for initial review of each submittal.
 3. Direct Transmittal to Consultant: Where the Contract Documents indicate that submittals may be transmitted directly to Architect's consultants, provide duplicate copy of transmittal to Architect. Submittal will be returned to Architect before being returned to Contractor.
 4. If intermediate submittal is necessary, process it in same manner as initial submittal.
 5. Allow 10 additional 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.

- D. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately **4 by 5 inches (100 by 125 mm)** on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 3. Include the following information on 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, if any
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Unique identifier, including revision number.
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Other necessary identification.
- E. Deviations: Notify the Architect in writing with a letter attached to the submittal of any deviations in the submittal from requirements of the Contract Documents. Product substitutions must be proposed in writing prior to submission of any shop drawings, product data in accordance with other Division 1 sections.
- F. Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.
- G. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.
- H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form, all compiled in electronic format files. Architect will **return submittals, without review**, received from sources other than Contractor.
1. On a separate sheet included with each electronic file, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.
 2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
 3. Transmittal Form: Provide locations on form for the following information:
 - a. Project name.
 - b. Date.
 - c. Destination (To:).
 - d. Source (From:).
 - e. Names of subcontractor, manufacturer, and supplier.
 - f. Category and type of submittal.
 - g. Submittal purpose and description.
 - h. Submittal and transmittal distribution record.
 - i. Remarks.
 - j. Signature of transmitter.

- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
 - 1. Submit ONE PDF format electronic copy of each submittal, unless otherwise indicated. Architect will return a marked-up file where applicable. Retain a copy as a Project Record Document in paper format for site use.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts. (Color reproduction required)
 - e. Manufacturer's catalog cuts.
 - f. Wiring diagrams showing factory-installed wiring.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Standard product operating and maintenance manuals.
 - j. Compliance with recognized trade association standards.
 - k. Compliance with recognized testing agency standards.
 - l. Application of testing agency labels and seals.
 - m. Notation of coordination requirements.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
 - 1. Preparation: Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shopwork manufacturing instructions.
 - g. Templates and patterns.
 - h. Schedules.

- i. Design calculations.
 - j. Compliance with specified standards.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.
 2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
 3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least **8-1/2 by 11 inches (215 by 280 mm)** but no larger than **30 by 40 inches (750 by 1000 mm)**.
 4. Submit each submittal, as follows:
 - a. Initial Submittal: Submit ONE PDF document. Architect, will return one PDF print.
 - b. Final Submittal: Submit ONE PDF electronic document, unless prints are required for operation and maintenance manuals. Submit prints where required for operation and maintenance manuals. **Mark up and retain one returned print as a Project Record Drawing.**
- D. Coordination Drawings: Comply with requirements in Division 1 Section "Project Management and Coordination."
- E. Samples: Prepare physical units of materials or products, including the following:
 1. Comply with requirements in Division 1 Section "Quality Requirements" for mockups.
 2. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 3. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 4. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Architect's sample where so indicated. Attach label on unexposed side that includes the following:
 - a. Generic description of Sample.
 - b. Product name or name of manufacturer.
 - c. Sample source.
 5. Additional Information: On an attached separate sheet, prepared on Contractor's letter-head, provide the following:
 - a. Size limitations.
 - b. Compliance with recognized standards.
 - c. Availability.
 - d. Delivery time.
 6. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
 - a. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.

7. Number of Samples for Initial Selection: Submit **two full sets** of available choices where establishment of a level of quality is required to be selected from manufacturer's product line. Architect will return submittal with options selected.
8. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
- F. Contractor's Construction Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for Construction Manager's action.
- G. Application for Payment: Comply with requirements in Division 1 Section "Payment Procedures."
- H. Schedule of Values: Comply with requirements in Division 1 Section "Payment Procedures."
- I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 2. Number and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.

2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
 1. Submit ONE PDF copy of each submittal, unless otherwise indicated. Architect will not return copies.
 2. Certificates and Certifications: Provide a notarized statement that includes signature of Contractor, testing agency, or design professional responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of the company.
 3. Test and Inspection Reports: Comply with requirements in Division 1 Section "Quality Requirements."
- B. Contractor's Construction Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation."
- C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.

- E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.
- G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.
- H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.
- I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
- J. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements.
- K. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.
- L. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- M. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- N. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 1 Section **"Closeout Procedures."**
- O. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable.
- P. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or

equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

1. Preparation of substrates.
 2. Required substrate tolerances.
 3. Sequence of installation or erection.
 4. Required installation tolerances.
 5. Required adjustments.
 6. Recommendations for cleaning and protection.
- Q. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- R. Material Safety Data Sheets: Submit information directly to Owner. If submitted to Architect, Architect will not review this information but will return it with no action taken.
- S. LEED Credit Data: Highlight required information and /or separate LEED documentation.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. 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.

3.2 ARCHITECT'S ACTION

- A. General: ARCHITECT WILL NOT REVIEW SUBMITTALS THAT DO NOT BEAR CONTRACTOR'S APPROVAL STAMP AND WILL RETURN THEM WITHOUT ACTION.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

END OF SECTION 013300



MHTN
ARCHITECTS

License and Indemnification Agreement

Project: HIGHLAND JUNIOR HIGH SCHOOL - OGDEN SCHOOL DISTRICT

MHTN Project Number: 2015505.00

In response to the Receiver's request to obtain Drawings, Specifications, electronic data, and/or other Instruments of Service (the "Information") produced by MHTN Architects, Inc. ("MHTN") for the above referenced project, MHTN and the Receiver agree to the following:

Receiver's authorized representative to initial Receiver's assent to each term in the space provided.

- _____ 1. MHTN grants to the Receiver a non-exclusive license to the Information for production of the Receiver's portion of the work for this project only. The Receiver shall not transfer or assign this license. MHTN retains its copyrights, the right to retain electronic data or other reproducible copies of the Information, and the right to use information, ideas, and/or concepts contained in the Information in the normal course of the its professional activities.
- _____ 2. The Information is for information purposes only. Under no circumstances shall the conveyance of the Information be deemed a sale by MHTN. MHTN makes no warranties, express or implied, of merchantability or of fitness of the Information for a particular purpose.
- _____ 3. The Receiver shall remove all title blocks and other references to MHTN, MHTN's consultants, and the project owner from the electronic data contained in the Information upon receipt.
- _____ 4. The Receiver shall remove all notes, text, and detail cuts from the electronic data contained in the Information upon receipt.
- _____ 5. Use of the Information shall be at Receiver's sole risk and without liability to MHTN or its consultants. The Receiver shall make no claim against MHTN or its consultants. The Receiver shall defend, indemnify, and hold harmless MHTN, MHTN's consultants, and agents and employees of any of them from and against all claims, damages, losses, and expenses, including but not limited to attorney fees and costs, arising out of the Receiver's use of the Information.

Receiver Company Name: _____

Officer & Title (printed): _____

Officer & Title (signed): _____

Date: _____

MHTN Architects, Inc.

Representative & Title (printed): _____

Representative & Title (signed): _____

Date: _____

SECTION 014000 - QUALITY 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 administrative and procedural requirements for quality assurance and quality control.
- B. Mock-ups specified in other specification sections establish a level of quality for appearance, and workmanship as specified herein.
- C. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- D. Related Sections include the following:
 - 1. Division 1 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
 - 2. Divisions 2 through 32 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. **Mockups establish the standard by which the Work will be judged.**
- D. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.4 DELEGATED DESIGN

- A. 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.

1.5 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, 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, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.
- C. Schedule of Tests and Inspections: Whether the responsibility of Owner or Contractor, prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Description of test and inspection.
 - 3. Identification of applicable standards.
 - 4. Identification of test and inspection methods.
 - 5. Number of tests and inspections required.
 - 6. Time schedule or time span for tests and inspections.
 - 7. Entity responsible for performing tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- D. Reports: Prepare and submit certified written reports that include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Ambient conditions at time of sample taking and testing and inspecting.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 12. Name and signature of laboratory inspector.
 - 13. Recommendations on retesting and reinspecting.
- E. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee

payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing products 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. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in Utah, and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.
- G. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.
- H. Preconstruction Testing: Testing agency shall perform preconstruction testing for compliance with specified requirements for performance and test methods.
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens and assemblies representative of proposed materials and construction. Provide sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Fabricate and install test assemblies using installers who will perform the same tasks for Project.
 - d. When testing is complete, remove assemblies; do not reuse materials on Project.
 - 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests

and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

- I. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 2. Notify Architect Seven days in advance of dates and times when mockups will be constructed.
 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 6. Demolish and remove mockups when directed, unless otherwise indicated.

1.7 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of the types of testing and inspecting they are engaged to perform.
 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the **Contract Sum will be adjusted by Change Order.**
- B. Contractor Responsibilities: On a limited basis as specified, the Contractor may provide quality-control services specified and required by authorities having jurisdiction.
 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ the same entity engaged by Owner, unless agreed to in writing by Owner.
 2. Notify testing agencies at least **24** hours in advance of time when Work that requires testing or inspecting will be performed.
 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Special Tests and Inspections: Owner will engage a testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.
 1. Testing agency will notify Architect, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 2. Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.

3. Testing agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 4. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 5. Testing agency will retest and reinspect corrected work.
- D. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.
- E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.
- F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
 5. Do not perform any duties of Contractor.
- G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field-curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 10 days of date established for **commencement of the Work**.

1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.
 2. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200 - REFERENCES

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 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": The term "approved," when used in conjunction with Architect's action on Contractor's submittals, applications, and requests, is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by Architect, requested by Architect, and similar phrases.
- D. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on Drawings; or to other paragraphs or schedules in Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference.
- E. "Regulations": 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.
- F. "Furnish": The term "furnish" means to supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": The term "install" describes operations at Project site including unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.
- I. "Installer": An installer is Contractor or another entity engaged by Contractor, as an employee, subcontractor, or contractor of lower tier, to perform a particular construction operation, including installation, erection, application, and similar operations.
- J. The term "experienced," when used with the term "installer," means having successfully completed a minimum of **five** previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- K. "Project site" is the space available for performing construction activities, either exclusively or in conjunction with others performing other work as part of Project. The extent of Project site is shown on the Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless 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 to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of the date of the Contract Documents, unless otherwise indicated.
- C. Conflicting Requirements: Where compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
 1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to Architect for a decision before proceeding.
- D. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from the publication source and make them available on request.
- E. Abbreviations and Names: Abbreviations and acronyms are frequently used in the Specifications and other Contract Documents to represent the name of a trade association, standards-developing organization, authorities having jurisdiction, or other entity in the context of referencing a standard or publication. Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of these entities. Refer to Gale Research's "Encyclopedia of Associations" or Columbia Books' "National Trade & Professional Associations of the U.S.," which are available in most libraries.

PART 2 - PRODUCTS -

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 014533 – STRUCTURAL TESTS AND SPECIAL INSPECTIONS

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 required for compliance with the International Building Code, Chapter 17, Structural Tests and Special Inspections.
- B. Structural testing and special inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve contractor of responsibility for compliance with other construction document requirements.
 - 1. Specific quality-assurance and control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality assurance and control procedures that facilitate compliance with the construction document requirements.
 - 3. Requirements for contractor to provide quality-assurance and control services required by architect, owner, or authorities having jurisdiction are not limited by provisions of this section.
- C. The owner will engage one or more qualified special inspectors and/or testing agencies to conduct structural tests and special inspections specified in this section and related sections and as maybe specified in other divisions of these specifications.
- D. Related Sections include but are nor limited to the following;
 - 1. 033000 CAST-IN-PLACE CONCRETE
 - 2. 051200 STRUCTURAL STEEL.
 - 3. 053100 STEEL DECK
 - 4. 312000 EARTH WORK
- E. Approved Agency: An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved by the building official.
- F. Construction Documents: Written, graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a building permit. Construction Documents include all supplemental instruction, sketches, addenda, and revisions to the drawings and specifications issued by the registered design professional beyond those issued for a building permit.

- G. Shop Drawings / Submittal Data: Written, graphic and pictorial documents prepared and / or assembled by the contractor based on the Construction Documents.
- H. Structural Observations: Visual observation of the structural system by a representative of the registered design professional's office for the general conformance to the approved construction documents. Structural observations are not considered part of the structural tests and special inspections and do not replace inspections and testing by the testing agency or special inspector.
- I. Special Inspector: A qualified person who demonstrating competence, to the satisfaction of the code enforcement official and registered design professional in responsible charge, for inspection of the particular type of construction or operation requiring special inspection. The special inspector shall be a licensed professional engineer or engineering intern or a qualified representative from the testing agency.
- J. Special Inspection, Continuous: The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed.
- K. Special Inspection, Periodic: The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work has been or is being performed and at the completion of the work.
- L. Testing Agency: A qualified materials testing laboratory under the responsible charge of a licensed professional engineer, approved by the code enforcement official and the registered design professional in responsible charge, to measure, examine, test, calibrate, or otherwise determine the characteristics or performance of construction materials and verify confirmation with construction documents.

1.3 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
 - 1. Minimum qualifications of inspection and testing agencies and their personnel shall comply with ASTM E329-03 Standard Specification for agencies on the Testing and / or Inspection of Materials used in construction.
 - a. Inspectors and individuals performing tests shall be certified for the work being performed as outlined in the appendix of the ASTM E329. Certification by organizations other than those listed must be submitted to the building official for consideration before proceeding with work.
 - 2. In addition to these requirements, local jurisdiction may have additional requirements. It is the responsibility of the testing and inspection agencies to meet local requirements and comply with local procedures.

1.4 CONFLICTING REQUIREMENTS, REPORTS AND TEST RESULTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to the registered design professional in responsible charge for a decision before proceeding.

- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to the registered design profession in responsible charge for a decision before proceeding.
- C. The special inspector's reports and testing agencies results shall have precedence over reports and test results provided by the contractor.
- D. Where a conflict exists between the construction documents and approved shop drawings / submittal data, the construction documents shall govern unless the shop drawings / submittal data are more restrictive. All conflicts shall be brought to the attention of the registered design professional in responsible charge.

1.5 SUBMITTAL BY SPECIAL INSPECTOR AND / OR TESTING AGENCY

- A. Special inspectors shall keep and distribute records of inspections. The special inspector shall furnish inspection reports to the building official, and to the registered design professional in responsible charge, contractor, architect, and owner. Reports shall indicate that work inspected was done in conformance to approved construction documents. Discrepancies shall be brought to the immediate attention of the contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the contractor for correction. If the discrepancies are not corrected the discrepancies shall be brought to the attention of the building official and to the registered design professional in responsible charge prior to the completion of that phase of the work. A final report documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted at a point in time agreed upon by the permit applicant and the building official prior to the start of work.
 - 1. Special inspection report and test results shall include, but not be limited to, the following:
 - a. Date of inspection.
 - b. Description of inspections or tests performed including location (reference grid lines, floors, elevations etc.).
 - c. Statement noting that the work, material and / or product conforms or does not conform to the construction document requirements.
 - 1) Name and signature of contractor's representative who was notified of work, material, and / or products that do not meet the construction document requirements.
 - d. Name and signature of special inspector and / or testing agency representative performing the work.
- B. Schedule of Non-Compliant Work: Each agent shall maintain a log of work that does not meet the requirements of the construction documents. Include reference to the original inspection / test report and subsequent dates of re-inspection / retesting.
- C. Reports and tests shall be submitted within 1 week of inspection or test. Schedule of Non-Compliant Work shall be updated daily and submitted on monthly intervals.

- D. Final report of Special Inspections. Submitted by each agent listed in the schedule of Structural Testing and Special Inspections.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 CONTRACT RESPONSIBILITY

- A. The contractor shall coordinate the inspection and testing services with the progress of their work. The contractor shall provide sufficient notice to allow proper scheduling of all personnel. The contractor shall provide safe access for performing inspection and on site testing.
- B. The contractor shall submit schedules to the owner, registered design professionals and testing and inspecting agencies. Schedule shall note milestones and durations of time for materials requiring structural tests and special inspections.
- C. Each contractor responsible for the construction of a seismic-force-resisting system, designated seismic system, or component listed in the quality assurance plan shall submit written contractor's statement of responsibility to the building official and the owner prior to the commencement of work on the system or component. The contractor's statement of responsibility shall contain the following:
 - 1. Acknowledgement of awareness of the special requirements contained in the quality assurance plan.
 - 2. Acknowledgement that control will be exercised to obtain conformance with the construction documents approved by the building official.
 - 3. Procedures for exercising control within the contractor's organization, the method and frequency of reporting and the distribution of the reports.
 - 4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.
- D. Each contractor responsible for the construction of a main windforce-resisting system, or a wind-resisting component listed in the quality assurance plan shall submit a written statement of responsibility to the building official and owner prior to the commencement of work on the system or component. The contractor's statement of responsibility shall contain the following:
 - 1. Acknowledgement of awareness of the special requirements contained in the quality assurance plan.
 - 2. Acknowledgement that control will be exercised to obtain conformance with the construction documents approved by the building official.
 - 3. Procedures for exercising control within the contractor's organization, the method and frequency of reporting and the distribution of the reports.
 - 4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.
- E. The contractor shall repair and / or replace work that does not meet the requirements of the construction documents.

1. Contractor shall engage an engineer / Architect to prepare repair and / or replacement procedures.
2. Engineer / Architect shall be registered in the state in which the project is located. Engineer shall be acceptable to the registered design professional in responsible charge, code enforcement official, and owner.
3. Procedures shall be submitted for review and acceptance by the registered design professional in responsible charge, code enforcement official and owner before proceeding with corrective action.

F. The contractor shall be responsible for costs of:

1. Re-testing and re-inspection of materials, work and / or products that do not meet the requirements of the construction documents and shop drawings / submittal data.
2. Review of the proposed repair and / or replacement procedures by the registered design professional in responsible charge and the inspectors and testing agencies.
3. Repair or replacement of work that does not meet the requirements of the construction documents.

3.2 STRUCTURAL OBSERVATIONS

- A. Structural observations may be made periodically as determined by the registered design professional in responsible charge.

3.3 TESTING AND INSPECTION

- A. Testing and inspection shall be in accordance with the attached Schedule of Special Inspections.
- B. Reference related specifications for the minimum level of inspections and testing. Provide additional inspections and testing as necessary to determine compliance with the construction drawings.

END OF SECTION 014533

SECTION 015000 - 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. Water service distribution.
 - 2. Sanitary facilities, including toilets.
 - 3. Ventilation.
 - 4. Electric power distribution service.
 - 5. Lighting.
 - 6. Telephone service.
- C. Support facilities include, but are not limited to, the following:
 - 1. Temporary signs.
 - 2. Waste disposal facilities.
 - 3. Field offices.
- D. Security and protection facilities include, but are not limited to, the following:
 - 1. Tree and plant protection.
 - 2. Temporary Enclosures.
- E. Related Sections include the following:
 - 1. Division 1 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
 - 2. Division 1 Section "Execution Requirements" for progress cleaning requirements.
 - 3. Divisions 3 through 32 for temporary heat, ventilation, and humidity requirements for products in those Sections.

1.3 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. Architect.
 - 2. Testing agencies.
 - 3. Personnel of authorities having jurisdiction.
- B. Water Service: Provide service extension from point of service for project site. The Contractor will be responsible for providing the tap and extending service for construction operations.

- C. Electric Power Service: Use electric power from service location established for the work.

1.4 SUBMITTALS

- A. Implementation and Termination Schedule: Within 15 days of date established for submittal of Contractor's Construction Schedule, submit a schedule indicating implementation and termination of each temporary utility.

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. Portable Chain-Link Fencing: Minimum **2-inch (50-mm)** 9-gage, galvanized steel, chain-link fabric fencing; minimum **6 feet (1.8 m)** high with galvanized steel pipe posts; minimum **2-3/8-inch (60-mm-)** OD line posts and **2-7/8-inch (73-mm-)** OD corner and pull posts, with **1-5/8-inch (42-mm-)** OD top and bottom rails. Provide **concrete** bases for supporting posts.

- C. Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less.
- D. Water: Potable.

2.2 EQUIPMENT

- A. General: Provide equipment suitable for use intended.
 - 1. Field Offices: **Mobile units** with lockable entrances, operable windows, and serviceable finishes; heated and air conditioned; on foundations adequate for normal loading
- B. 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.
- C. 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.
- D. 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.
- E. 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: Connect to existing service in place
 - 1. Avoid interruptions in service to make connections for temporary services.
 - 2. Provide adequate capacity at each stage of construction.
- B. Water Service: Use water service facilities from service tap for the project. Upon Substantial Completion, restore disturbed facilities to condition existing before initial 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 (30-m) 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.
- C. 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. Use of existing facilities will not be permitted while school is in session.
 3. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel who handle materials that require wash up. Dispose of drainage properly. Supply cleaning compounds appropriate for each type of material handled.
 - a. Provide safety showers, eyewash fountains, and similar facilities for convenience, safety, and sanitation of personnel.
- D. 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 (30-m) 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.
- E. 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 lamp per 500 sq. ft. (45 sq. m), uniformly distributed, for general lighting, or equivalent illumination.
 3. Provide one 100-W incandescent lamp every 50 feet (15 m) in traffic areas.
 4. Provide one 100-W incandescent 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.
- F. 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. 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.
 2. Provide **voice-mail service or answering machine** on Superintendent's telephone.
 3. Furnish superintendent with cell phone for use when away from field office.
- G. Internet connection on Site: Provide full e-mail service and internet connection on-site for use in electronic communications with Architect.

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.
 2. Provide incombustible construction for offices, shops, and sheds located within construction area or within **30 feet (9 m)** 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. Project Identification and Temporary Signs: Prepare Project identification and other signs in sizes complying with University's requirements. 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 of at least one sheet of $\frac{3}{4}$ inch thick material. 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. Content and location of directional signs will be at the direction of the Owner.
- C. Janitorial Services: Provide janitorial services on a daily basis for temporary offices, first-aid stations, toilets, wash facilities, lunchrooms, and similar areas and areas of the facility affected by the Work.
- D. 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 at Project site. Keep office clean and orderly.
1. Provide fluorescent light fixtures capable of maintaining average illumination of **20 fc (215 lx)** at desk height. Provide 110- to 120-V duplex outlets spaced at not more than **12-foot (4-m)** intervals, 1 per wall in each room.

- E. 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.
 - 1. Construct framing, sheathing, and siding using fire-retardant-treated lumber and plywood.
 - 2. Paint exposed lumber and plywood with exterior-grade acrylic-latex emulsion over exterior primer.
- F. 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.

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. 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.
- C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to **erosion- and sedimentation-control Drawings or requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.**
 - 1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
 - 2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
 - 3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from the project site during the course of the project.
 - 4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Security Enclosure and Lockup: Install substantial temporary enclosure around exterior work and partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security when exterior openings are created in the course of the work.
- F. 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- (16-mm-) thick exterior plywood.
- G. 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. (2.3 sq. m) or less with plywood or similar materials.
 3. Install tarpaulins securely using fire-retardant-treated wood framing and other materials.
 4. Where temporary wood or plywood enclosure exceeds 100 sq. ft. (9.2 sq. m) in area, use fire-retardant-treated material for framing and main sheathing.

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: 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. 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 015000

SECTION 016000 - 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;
- B. Related Sections include the following:
 - 1. Division 1 Section "Closeout Procedures" for submitting warranties for contract closeout.
 - 2. Divisions 2 through 33 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, that 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.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor are allowed only before bid, and will not be considered in the course of Construction.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design", "Design Standard" or similar, 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 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. 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 5 days after date of commencement of the Work, submit a PDF copy 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 7 days after date of commencement of the Work, submit a PDF copy 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 7 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. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." 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.
- B. Storage: Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

- A. 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 3 through 33 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.
 2. Manufacturer/Source: Where Specification paragraphs or subparagraphs titled "Manufacturer" or "No Sub" name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements.
 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.
 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.
 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. Basis-of-Design Products: Where Specification paragraphs or subparagraphs titled "Basis-of-Design Products" or "Design Standard" 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 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.
 8. 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.
 9. 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.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Coordination of Owner-installed products.
 - 6. Progress cleaning.
 - 7. Starting and adjusting.
 - 8. Protection of installed construction.
 - 9. Correction of the Work.
- B. Related Sections:
 - 1. Division 01 Section "Submittal Procedures" for submitting surveys.
 - 2. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
 - 3. Division 02 Section "Selective Structure Demolition" for demolition and removal of selected portions of the building.
 - 4. Division 07 Section "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

- A. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
 - 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.

2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate how long services and systems will be disrupted.

1.5 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.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from the Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
 - a. Primary operational systems and equipment.
 - b. Fire separation assemblies.
 - c. Air or smoke barriers.
 - d. Fire-suppression systems.
 - e. Mechanical systems piping and ducts.
 - f. Control systems.
 - g. Communication systems.
 - h. Conveying systems.
 - i. Electrical wiring systems.
 - j. Operating systems of special construction.
 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
 - a. Water, moisture, or vapor barriers.
 - b. Equipment supports.
 - c. Piping, ductwork, vessels, and equipment.
 - d. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

1.6 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
 1. For projects requiring compliance with sustainable design and construction practices and procedures, utilize products for patching that comply with requirements of Division 01 Section "Sustainable Design Requirements."
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: 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 mechanical and electrical systems, and other construction affecting the Work.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, 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. 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.
- B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Architect according to requirements in Division 01 Section "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a **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 **and GContractor** /Construction Manager 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.

3.4 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 of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces.
- 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. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 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.
 3. Coordinate installation of anchorages. 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.
- H. 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.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 CUTTING AND PATCHING

- A. Cutting and Patching, General: Where new construction requires modification, employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Temporary Support: Provide temporary support of work to be cut.
- C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- D. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements of Division 01 Section "Summary."
- E. Existing Mechanical/Electrical Systems: Where existing systems are required to be removed, relocated, or abandoned, bypass such systems before cutting to minimize interruption to occupied areas.
- F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 5. Proceed with patching after construction operations requiring cutting are complete.
- G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
- H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.6 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. 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 waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Utilize containers intended for holding waste materials of type to be stored.
 4. Coordinate progress cleaning for joint-use areas where more than one installer has worked.
- 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 in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.
- H. 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.
- I. 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 operability without damaging effects.
- J. 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.

3.8 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Division 01 Sections
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Division 01 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.
 - 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 017300

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Disposing of nonhazardous demolition and construction waste.

1.3 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 50 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials.

1.5 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within 7 days of date established for commencement of the Work.
- B. Processing Facility Records: Indicate receipt and acceptance of waste by processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices for products that may be recycled, if any.
- C. Landfill Disposal Records: Indicate receipt and acceptance of waste by landfills licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
 - 1. Review and discuss waste management plan .
 - 2. Review procedures for periodic waste collection and transportation to disposal facilities.
 - 3. Review waste management requirements for each trade.

1.7 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to requirements of this Section. Plan shall consist of waste identification and analysis. . Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of construction waste generated by the Work

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 - 1. Comply with Division 01 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.
- B. Waste Management : If recycling is to be utilized for corrugated packaging or other salvable waste Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged or recycled.

3.2 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION 017419

SECTION 017700 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
- B. Related Sections:
 - 1. Division 01 Section "Execution" for progress cleaning of Project site.
 - 2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 3. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 4. Divisions 02 through 33 Sections for specific closeout and special cleaning requirements for the Work in 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 with request.
 - 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 photographic documentation, 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. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
12. Complete final cleaning requirements, including touchup painting.
13. 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 final completion, complete the following:

1. Submit a final Application for Payment according to Division 01 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. 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.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization 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. Use CSI Form 14.1A.

1. Organize list of spaces in sequential order.
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.
4. Submit list of incomplete items in the following format (verify with Architect):
 - a. PDF electronic file.
 - b. Three paper copies of product schedule or list, unless otherwise indicated. Architect will return two copies.

1.6 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. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. 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, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive **8-1/2-by-11-inch (215-by-280-mm)** 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.
 4. Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

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.

1. Use cleaning products that meet Green Seal GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform 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 in areas disturbed by construction activities of rubbish, waste material, litter, and other foreign substances.
 - b. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - c. Clean exposed interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition.
 - d. Remove debris and surface dust from limited access spaces, plenums, shafts and similar spaces.
 - e. Sweep concrete floors broom clean in unoccupied spaces.
 - f. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - g. 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.
 - h. Remove labels that are not permanent.
 - i. 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 other required labels and identification, including mechanical and electrical nameplates.
 - j. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint droppings, and other foreign substances.
 - k. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 - l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - n. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter upon inspection.

- 1) Clean HVAC system in compliance with NADCA Standard 1992-01.
Provide written report upon completion of cleaning.
- o. 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.
- p. Leave Project clean and ready for occupancy.
- C. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section
"Construction Waste Management and Disposal."

END OF SECTION 017700

SECTION 017823 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals in electronic format, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Product maintenance manuals.
 - 5. Systems and equipment maintenance manuals.
- B. Related Sections:
 - 1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
 - 2. Divisions 02 through 33 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 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual specification sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Where applicable, clarify and update reviewed manual content to correspond to modifications and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format (verify with Architect):
 - 1. PDF electronic file. Assemble each manual into a composite electronically-indexed file. Submit on digital media acceptable to Architect.

- a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically-linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft submittals.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
 - 1. Correct or modify each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of comments and prior to commencing demonstration and training.

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 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- 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: 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 and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Name and contact information for Commissioning Agent.
9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. 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.

E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based upon file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel upon opening file.

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. Use designations for systems and equipment indicated on Contract Documents.
 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. Use designations for products indicated on Contract Documents.
 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 MANUALS

- 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 and drawing or schedule designation or identifier where applicable.
- 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 MANUALS

- 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 and drawing or schedule designation or identifier where applicable.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard 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 video recording, 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. 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.
- B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- C. 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.
- D. 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.
- E. 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 01 Section "Project Record Documents."
- F. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
 - 4. Miscellaneous record submittals.
- B. Related Sections:
 - 1. Division 01 Section "Execution" for final property survey.
 - 2. Division 01 Section "Closeout Procedures" for general closeout procedures.
 - 3. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 4. Divisions 02 through 33 Sections for specific requirements for project record documents of the Work in those Sections.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set(s) of marked-up record prints.
 - 2. Number of Copies: Submit copies of record Drawings as follows:
 - a. Initial Submittal: Submit one paper copy set or PDF electronic files (verify with Architect) of marked-up record prints and one set of plots from corrected record digital data files. Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal: Submit one paper copy set or PDF electronic files (verify with Architect) of marked-up record prints. Print each Drawing, whether or not changes and additional information were recorded.
 - c. Final Submittal: Submit one paper copy set or PDF electronic files of marked-up record prints, one set(s) of record digital data files, and three set(s) of record digital data file plots. Plot each drawing file, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit one paper copy or annotated PDF electronic files (verify with Architect) of Project's Specifications, including addenda and contract modifications.

- C. Record Product Data: Submit one paper copy or annotated PDF electronic files and directories (verify with Architect) of each submittal.
 - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: Refer to other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one paper copy or annotated PDF electronic files and directories (verify with Architect) of each submittal.
- E. Reports: Submit written report weekly indicating items incorporated in Project record documents concurrent with progress of the Work, including modifications, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings.
 - 1. Preparation: 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 provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding archive photographic documentation.
 - 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked-up record prints.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 3. Refer instances of uncertainty to Architect for resolution.
 4. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
 - a. Refer to Division 01 Section "Submittal Procedures" for requirements related to use of Architect's digital data files.
 - b. Architect will provide data file layer information. Record markups in separate layers.
- C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
 2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
- D. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Format: Annotated PDF electronic file with comment function enabled.
 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications 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. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 - 4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
 - 5. Note related Change Orders, record Product Data, and record Drawings where applicable.
- B. Format: Submit record Specifications as annotated PDF electronic file or paper copy. Verify with Architect.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 - 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 Specifications, and record Drawings where applicable.
- B. Format: Submit record Product Data as annotated PDF electronic file or paper copy. Verify with Architect.
 - 1. Include record Product Data directory organized by specification section number and title, electronically linked to each item of record Product Data.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. 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.
- B. Format: Submit miscellaneous record submittals as PDF electronic file or paper copy. Verify with Architect.
 - 1. Include miscellaneous record submittals directory organized by specification section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and modifications to project record documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 017839

SECTION 017900 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. 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 DVDs.
- B. Related Sections:
 - 1. Divisions 02 through 33 Sections for specific requirements for demonstration and training for products in those Sections.

1.3 SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and 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. Indicate proposed training modules utilizing manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
- B. Qualification Data: For **facilitator, instructors and videographer**.
- 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.

1.4 CLOSEOUT SUBMITTALS

- A. Demonstration and Training DVDs: 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 videographer.
 - c. Name of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Date of video recording.
2. Transcript: Prepared on 8-1/2-by-11-inch (215-by-280-mm) paper, punched and bound in heavy-duty, three-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 video recording. Include name of Project and date of video recording on each page.
3. At completion of training, submit complete training manual(s) for Owner's use.

1.5 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.
- D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Division 01 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.

1.6 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.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. **Program Structure:** Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
1. Motorized doors
 2. Equipment including projection screens,
 3. Fire Protection systems
 4. elevators
 5. Heat generation equipment
 6. Refrigeration systems
 7. HVAC systems
 8. HVAC instrumentation and controls
 9. electrical service and distribution and controls including transformers and switchboards. Panelboards, and motor controls
 10. Lighting equipment and controls
 11. Communications systems including surveillance. Clocks, programming voice and data.
- 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 as applicable to the system, equipment, or component:
1. **Basis of System Design, Operational Requirements, and Criteria:** Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. 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 training manual organized in coordination with requirements in Division 01 Section "Operations and Maintenance Data."
- B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. 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.
- C. 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 the General Contractor** with at least 14 days' advance notice.
- 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 DVDs.

- A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. 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 Recording Format: Provide high-quality color digital recordings with menu navigation in format acceptable to Architect.
- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
- D. Narration: Describe scenes on video recording by **audio narration by microphone while** video recording is recorded. Include description of items being viewed.
- E. All CD OR DVD's shall be authored with Adobe Acrobat. The authoring shall, but not be limited to include the following:

- 1) All drawings and documentation shall be included on the CD or DVD in a PDF format. These drawings shall be provided in an electronic format to the company contracted to create the CD OR DVD and shall include the civil engineering, architectural, structural, electrical and mechanical sections. The drawings shall be indexed and hyper-linked to each page of the drawings. Buttons shall be placed on the top of each page to take the user back to the index or to the main pages.
 - 2) All information on the CD OR DVD shall be printable plain paper with the design drawings and automatic temperature control drawings printable on plain paper.
 - 3) Linked information such that the user can key word search for information.
 - 4) Use of multimedia formatting (text, pictures, graphics and sound etc.) will be used to make the information more accessible and understandable.
 - 5) All documentation shall be converted to an unchangeable Portable Document Format (.PDF).
 - 6) The **CD OR DVD** shall start automatically when inserted in the drive under the Windows operation system. Any directions to continue will be observable on the screen.
 - 7) Operation and maintenance information to be supplied to the company contracted to do the **CD OR DVD** by the contractor and suppliers providing the materials and equipment.
- F. At the beginning or start-up of the CD OR DVD there shall be a General Information index screen to direct the user to the portion of the manual desired. This index screen will consist of five (5) major groups. The groups will include:
- A) Contract Developers: This section is to include:
 - 1) Names of architects, engineers and contractors with address and telephone number.
 - B) Warranties List: This section to include:
 - 1) A list of all the contractors with a link to their warranty for their part of the job.
 - C) Drawings: drawings shall be indexed as outlined in line item three (3).
 - D) Specification: A book-marked set of the spec will be included
 - E) Manufacturer's Operation and Maintenance Manuals:
 - 1) **Architectural or General Contractor section:**
 - 2) **Mechanical section:**
 - 3) **Electrical section:**
 - 4) Special construction section – where cleanrooms may be addressed.The manuals indexes shall being in alphabetical order and have links to each manual. Each manual that has a table of contents (TOC), shall be book marked by that TOC. Each manual shall have navigational buttons on the top of each page to return the user back to Manuals Index and the Main or Home TOC.

One source of procurement is:

Manuals Access

PO Box 136

Sandy, UT 84091-0136

Phone: 801-619-2082

END OF SECTION 017900

SECTION 024119 - SELECTIVE STRUCTURE 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 selected portions of existing structure to accommodate new construction.
 - 2. Removal of existing finishes and materials in designated areas.
 - 3. Patching and repairs where existing finishes and systems are disturbed.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Execution" for cutting and patching procedures for selective demolition operations.
 - 2. Division 1 Section "Temporary Facilities Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and environmental protection measures for selective demolition operations.
 - 3. Division 22 and 23 Sections for cutting, patching, or relocating mechanical items.
 - 4. Division 26 Sections for cutting, patching, or relocating electrical items.

1.3 DEFINITIONS

- A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.
- B. Remove and Salvage: Items indicated to be removed and salvaged remain the Owner's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Owner's designated storage area.
- C. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated.
- D. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Architect, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.4 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.

1.5 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections, for information only, unless otherwise indicated.
- B. Proposed dust-control measures to protect areas outside the limits of work.
- C. Proposed noise-control measures.
- D. Schedule of selective demolition activities indicating the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
 - 2. Interruption of utility services.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Detailed sequence of selective demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.
 - 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
 - 6. Locations of temporary partitions and means of egress.
- E. Inventory of items to be removed and salvaged.
- F. Inventory of items to be removed by Owner.
- G. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by selective demolition operations.

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Predemolition Conference: Conduct conference at Project site to comply with preinstallation conference requirements of Division 1 Section "Project Management and Coordination"

1.7 PROJECT CONDITIONS

- A. Owner will occupy portions of the building immediately adjacent to selective demolition area.
- B. If conflicts with Owner's operation arise, conduct selective demolition so that Owner's operations will not be disrupted. Work within non-standard hours may be required. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

- C. Owner assumes no responsibility for actual condition of buildings to be selectively demolished.
 - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- D. Asbestos: It is not expected that asbestos will be encountered in the Work. If any materials suspected of containing asbestos are encountered, do not disturb the materials. Immediately notify the Architect and the Owner.
- E. Storage or sale of removed items or materials on-site will not be permitted.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

- A. Use repair materials identical to existing materials.
 - 1. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 2. Use materials whose installed performance equals or surpasses that of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to the Architect.
- E. Survey the condition of the building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective demolition.
- F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES

- A. Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to governing authorities.
 - a. Provide not less than 72 hours' notice to Owner if shutdown of service is required during changeover.
- B. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving building to be selectively demolished.
 - 1. Arrange to shut off indicated utilities with utility companies, if required.
 - 2. Where utility services are required to be removed, relocated, or abandoned, provide bypass connections to maintain continuity of service to other parts of the building before proceeding with selective demolition.
 - 3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit after bypassing.

3.3 REPARATION

- A. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.
- B. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, 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 governing regulations.
- C. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around selective demolition area.
 - 1. Protect walls, ceilings, floors, and other existing finish work that are to remain and are exposed during selective demolition operations.
 - 2. Cover and protect furniture, furnishings, and equipment that have not been removed.
- D. Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas not affected by the work of this contract from fumes and noise. Confirm areas requiring dustproof partitions with Owner.
 - 1. Construct dustproof partitions of not less than nominal 4-inch (100-mm) studs, 5/8-inch (16-mm) gypsum wallboard with joints taped on occupied side, and 1/2-inch (13-mm) fire-retardant plywood on the demolition side.
 - 2. Insulate partition 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.
- E. Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of building to be selectively demolished.

1. Strengthen or add new supports when required during progress of selective demolition.
- F. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level.
- G. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.4 SELECTIVE DEMOLITION

- A. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete Work within limitations of governing regulations and as follows:
1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. To minimize disturbance of adjacent surfaces, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 4. Maintain adequate ventilation when using cutting torches.
 5. Remove decayed or unsuitable materials and promptly dispose of off-site.
 6. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 7. Locate selective demolition equipment throughout the structure and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 8. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
 9. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.
- B. Remove air-conditioning equipment if required without releasing refrigerants.

3.5 SALVAGE OF EXISTING COMPONENTS

- A. Where existing components are indicated to be removed and relocated, remove anchors and relocate units as a single component to new location. Secure in place and align with existing work to remain.

3.6 PATCHING AND REPAIRS

- A. Promptly patch and repair holes and damaged surfaces caused to adjacent construction by selective demolition operations.
- B. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.

- C. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.
- D. Patch and repair floor and wall surfaces in the new space where demolished walls or partitions extend one finished area into another. Provide a flush and even surface of uniform color and appearance.
 - 1. Closely match texture and finish of existing adjacent surface.
 - 2. Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
 - 3. Where patching smooth painted surfaces, extend final paint coat over entire unbroken surface containing the patch after the surface has received primer and second coat.
 - 4. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - 5. Inspect and test patched areas to demonstrate integrity of the installation, where feasible.
- E. Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.8 CLEANING

- A. Sweep the building broom clean on completion of selective demolition operation.
- B. Change filters on air-handling equipment on completion of selective demolition operations.

END OF SECTION

SECTION 033000 - CAST-IN-PLACE CONCRETE

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 specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings.
 - 2. Foundation walls.
 - 3. Slabs-on-grade.
 - 4. Walls and columns.
 - 5. Suspended slabs
 - 6. Underslab vapor retarder
 - 7. Polystyrene fill for formwork
- B. Related Sections include the following:
 - 1. Division 4 section Unit Masonry Assemblies for precast trim
 - 2. Division 31 Section "Earth Moving" for drainage fill under slabs-on-grade.
 - 3. Division 32 Sections for concrete pavement and walks.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.
- B. Drying Shrinkage Limit: Percentage change in length after 28 days of drying when tested per ASTM C157 with 4 inch x 4 inch x 11 inch specimen moist cured 7 days prior to drying.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
 - 2. Submit 30-day consecutive recent mix design compressive strength history for each mix design per ACI 318 requirements, including statistical values necessary for verification of f'c.

3. Include drying shrinkage limit test results for interior slabs on grade mix design.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.
- E. Qualification Data: For Installer, testing agency.
- F. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 1. Aggregates.
- G. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 1. Location of construction joints is subject to approval of the Architect.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For **Installer**
- B. Welding certificates.
- C. Material Certificates: For each of the following, signed by manufacturers:
 1. Cementitious materials.
 2. Admixtures.
 3. Form materials and form-release agents.
 4. Steel reinforcement and accessories.
 5. Fiber reinforcement.
 6. Curing compounds.
 7. Repair materials.
- D. Floor surface slope measurements indicating compliance with specified tolerances.
- E. Field quality-control reports.
- F. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- G. Mockups: Cast concrete slab-on-grade and formed-surface panels to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship.
 - 1. Build panel approximately 200 sq. ft. for slab-on-grade and 100 sq. ft. for formed surface in the location indicated or, if not indicated, as directed by Architect.
 - 2. Approved panels may become part of the completed Work if undisturbed at time of Substantial Completion.
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.
 - e. Special concrete finish subcontractor.
 - 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, forms and form removal limitations, shoring and reshoring procedures, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

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 Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 - 2. Products: Subject to compliance with requirements, provide one of the products specified.
 - 3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
 - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
- C. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.

2.4 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 FIBER REINFORCEMENT

- A. Synthetic Micro-Fiber: fibrillated polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1 to 2-1/4 inches (25 to 57 mm) long.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fibrillated Micro-Fibers:
 - 1) Grace Construction Products, W. R. Grace & Co.; Grace Fibers.
- B. Synthetic Macro-Fiber: Polyolefin macro-fibers engineered and designed for use in concrete, elevated slabs on metal deck complying with ASTM C 1116/C 1116M, Type III, with an equivalent diameter between 0.016" and 0.05", and having a minimum length/equivalent diameter of 50. Fibers left exposed shall not be burned off
 1. Products: Subject to compliance with requirements, **[provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. 3M; Scotchcast Polyolefin Fibers .
 - b. Euclid Chemical Company (The), an RPM company; Tuf-Strand SF.
 - c. FORTA Corporation; FORTA FERRO.
 - d. Grace Construction Products, W. R. Grace & Co.; Strux 90/40.
 - e. Nycon, Inc.; XL.
 - f. Propex Concrete Systems Corp.; Fibermesh 650.
 - g. Sika Corporation; Sika Fiber

2.6 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I/II, gray. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F.
- B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
 - 1. Maximum Coarse-Aggregate Size: As indicated.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M.

2.7 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.8 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Construction Chemicals - Building Systems; Confilm.
 - b. Dayton Superior Corporation; Sure Film (J-74).
 - c. Sika Corporation; SikaFilm.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.

- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Construction Chemicals - Building Systems; Kure-N-Seal WB.
 - b. Dayton Superior Corporation; Safe Cure and Seal (J-18).
 - c. Euclid Chemical Company (The), an RPM company; Aqua Cure VOX; Clearseal WB 150.

2.9 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.10 EXPANDED POLYSTYRENE LIGHTWEIGHT FILL

- A. Expanded-Polystyrene Board Insulation: Shall comply with ASTM D6817.
- B. Provide EPS Geofoam with physical properties as required to sufficiently carry a uniformly distributed deadload of **50 pounds per square inch** concurrently with a uniformly distributed live load of 100 pounds per square foot to support emergency vehicle loading. Combined dead and live load stresses shall not exceed 1% strain.
- C. Geofoam Connectors: Geofoam manufacturer shall supply multibarbed galvanized steel or stainless steel sheet connectors as required to minimize block to block movement during installation.
- D. The geomembrane shall be reinforced or unreinforced geomembrane. It shall be manufactured from a tri-polymer consisting of polyvinyl chloride, ethylene interpolymers, and polyurethane or a comparable polymer combination. It shall meet the following physical and chemical requirements, specified as minimum or maximum, not average roll properties:
 - 1. Thickness, mils Minimum 28 ASTM D 751
 - 2. Unleaded Gasoline Vapor Maximum 0.40 Transmission Rate, ounces per square foot per 24 hours ASTM D 814
 - 3. Grab tensile strength, pounds Minimum 600 both machine and cross direction (1-inch grip 4-inch x 8-inch sample) ASTM D 751
 - 4. Elongation at break. percent Minimum 20 ASTM D 751

5. Toughness, Minimum 14,000 grab tensile times percent elongation for example: 620 pounds x 23% = 14,260
6. Puncture resistance, pounds Minimum 800 ASTM D 751 (ball tip)
7. Cold crack, pass degrees Fahrenheit -30 ASTM D 2136 (1-inch mandrel, 4 hours)
8. Factory Seams Minimum 2 Bonded width, inches each seam
9. Shear, pounds Minimum 320 ASTM D 751 (modified per National Sanitation Foundation Std. No. 54) Fail in base geomembrane material
10. A Certificate of Compliance shall be furnished stating that the selected geomembrane has been tested. and it meets the above mentioned requirements, and is:
 - a. Free from pinholes, tears, and other defects which would cause leakage of liquids through the geomembrane.
 - b. Acceptable for spill containment of hydrocarbons, including automobile gasolines, aviation gas, diesel fuel, kerosene, hydraulic fluid, methanol, ethanol, mineral spirits. and naphtha.

2.11 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 1. Fly Ash: 25 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
 4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings: Proportion normal-weight concrete mixture as follows:
 1. Minimum Compressive Strength: 3000 psi (31 MPa) at 28 days.
 2. Maximum Water-Cementitious Materials Ratio: 0.50.
 3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
 4. Maximum Course Aggregate Size: 1 inch nominal.

- B. Walls, Columns, Grade Beams and Concrete Shear Walls: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 4500 psi (34.5 MPa) at 28 days.
 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 3. Slump Limit: 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
 4. Maximum Course Aggregate Size: $\frac{3}{4}$ inch nominal.
 5. Air Content: 5 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size.
- C. Interior Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 3000 psi (31 MPa) at 28 days.
 2. Maximum Water-Cementitious Materials Ratio: 0.48.
 3. Slump Limit: 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
 4. Maximum Course Aggregate Size: 1-1/2 inch nominal.
 5. Drying Shrinkage Limit: 0.040 percent.
- D. Suspended Slabs: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 3000 psi (31 MPa) at 28 days.
 2. Maximum Water-Cementitious Materials Ratio: 0.50.
 3. Slump Limit: 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
 4. Maximum Course Aggregate Size: 3/4 inch nominal.
 5. Synthetic Macro-Fiber: Applies to slabs on metal deck. Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 4.0 lb/cu. Yd unless noted otherwise.
- E. All other Site Cast Concrete: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 4500 psi (31 MPa) at 28 days.
 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 3. Slump Limit: 4 inches (100 mm), 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
 4. Maximum Course Aggregate Size: 3/4 inch nominal.
 5. Air Content: 5 percent, plus or minus 1.5 percent at point of delivery for 1-inch (25-mm) 3/4-inch (19-mm) nominal maximum aggregate size.

2.13 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.14 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

2.14 VAPOR RETARDERS

- A. Plastic Vapor Retarder: ASTM E 1745, Class A with a nominal perm rating not exceeding 0.03. Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Available Products:
 - a. Fortifiber Corporation; Moistop Ultra A.
 - b. Raven Industries Inc.; Vapor Block 15.
 - c. Reef Industries, Inc.; Griffolyn Type-105.
 - d. Stego Wrap Class A Vapor Retarder
 - e. WR Meadows Perminator 10

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 1. **Class A**, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
 2. **Class B**, 1/4 inch (6 mm) for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 1. Install keyways, reglets, recesses, and the like, for easy removal.
 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.

- I. Form openings, chases, offsets, sinkages, keyways, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls at 10 feet on center maximum. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.7 LIGHTWEIGHT FOAM FILL MATERIALS

- A. Place a leveling course of sand, 2 inches (50 mm) thick, over subgrade. Finish leveling course to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.
 1. Place leveling course on subgrades free of mud, frost, snow, or ice.
- B. Install geofoam blocks in layers with abutting edges and ends and with the long dimension of each block at right angles to blocks in each subsequent layer. Offset joints of blocks in successive layers.
- C. Install geofoam connectors at each layer of geofoam to resist horizontal displacement according to geofoam manufacturer's written instructions.
- D. Cover geofoam with separation geotextile before placing overlying materials.

3.8 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
 - 1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces exposed to public view.
 - 2. **Class "A" Finish free of irregularities in surface larger than 1/8 inch, no honeycomb or other defects that would require topical finishes to correct.**
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces 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.

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces indicated.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces exposed to view.
 - 2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
- D. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.12 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and

during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
 - 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period

3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least six month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports
- C. Inspections:
1. Steel reinforcement placement.
 2. Steel reinforcement welding.
 3. Headed bolts and studs.
 4. Verification of use of required design mixture.
 5. Concrete placement, including conveying and depositing.
 6. Curing procedures and maintenance of curing temperature.
 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof. Composite samples for footings, walls, and other site-cast concrete may be increased to one set for each additional 150 cu. yd. (114 cu. m) per day but not less than one per every 5000 sq. ft. of walls or slabs per day.
 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change. Test slump at each truck for concrete used in post tensioned slabs and beams.
 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture. Test air content at each truck for concrete used in post tensioned slabs and beams.

4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
 5. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days, and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 7. Testing using temperature-dependant maturity-meters embedded within the concrete, if used, shall be correlated with actual concrete compressive strength testing of representative samples as outlined above.
 8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
 9. Test results shall be reported in writing to Architect, Structural Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for 3-, 7-, and 28-day tests.
 10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
 12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- E. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 24 hours of finishing.

END OF SECTION 033000

SECTION 033519 – SPECIAL CONCRETE FLOOR FINISHES

PART 1 GENERAL

1.01 SUMMARY

- A. This section includes the following.
 - 1. Grinding existing slabs
 - 2. Applying Stain in colors scheduled, Sealer and Hardener and Polishing existing slab to a gloss finish level 800 GRIT with epoxy border.
 - 3. Areas where existing VCT are removed must be ground to sufficient depth to eliminate pattern staining in the slab finish.

1.02 REFERENCES

- A. American Society for Testing and Materials:
 - 1. ASTM-C779, Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces
 - 2. ASTM C805, Impact Strength
 - 3. ASTM G23-81, Ultraviolet Light & Water Spray
 - 4. ASTM 1028, Co-Efficient of Friction

1.03 SUBMITTALS

- A. Comply with pertinent provisions of Division 1 Section- Product Requirements.
- B. Product data:
 - 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. Submit special concrete finishes manufacturer's Material Safety Data Sheet (MSDS) and other safety requirements.
 - 6. Follow all special concrete finishes published manufacturer's installation instructions.
- C. Test Reports:
 - 1. Provide certified test reports, prepared by an independent testing laboratory, confirming compliance with specified performance criteria.

1.04 QUALITY ASSURANCE

- 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:
1. 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. Mock-ups:
1. Apply mock-ups of each type finish, to demonstrate typical joints, surface finish, color variation (if any), and standard of workmanship.
 - a. Build mock-ups approximately 50 square feet in the location indicated or if not indicated, as directed by the Architect or Owner Representative within the field of work affected by work of this Section.
 - b. Notify Architect or Owner Representative seven days in advance of dates and times when mock-ups will be constructed.
 - c. Obtain from the Architect or Owner Representative approval of mock-ups before starting construction.
 - d. Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed work. Standards will include level of sheen, uniformity of concrete finish that receives surface finish.
 - e. Approved mock-ups may become part of the completed work if undisturbed at time of substantial completion.
- D. Protection
1. Prevention of exposure to fluids is essential to prevent petroleum stains from the concrete surface.
 - a. All hydraulic powered equipment must be diapered to avoid staining of the concrete.
 - b. No pipe cutting machine will be used on the inside floor slab.
 - c. Steel must not be placed on interior slab to avoid rust staining.
 2. Adjacent surfaces that remain undisturbed shall be masked to prevent slurry or spray from soiling surfaces of base, locker bases and walls adjacent to the work.
- E. Pre-Installation Conference:
1. Conduct conference at project site to comply with requirements in Division 1 Section "Project Management and Coordination"

1.05 DELIVERY, STORAGE AND HANDLING

- A. 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.
- B. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.
- C. Dispense special concrete finish material from factory numbered and sealed containers. Maintain record of container numbers.

1.06 PROJECT CONDITIONS

- A. Environmental limitations:
 - 1. Comply with manufacturers written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting topping performance.
 - a. Application of the hardener, densifier, finish shall take place a minimum of 10 days prior to installation of items bearing on slab, providing a complete, uninhibited concrete slab for application.
- B. Close areas to traffic during floor application and after application, for time period recommended in writing by manufacturer.

PART 2 – PRODUCTS

2.01 MATERIALS AND MANUFACTURER

- A. HARDENING/SEALING AGENT
- B. Manufacturers include , but are not limited to, the following:
 - 1. Convergent Concrete Technologies, Pentra-Sil
 - 2. Prosoco , Inc. Consolideck, LS, LS Guard
 - 3. Retro-Plate, Advanced Floor Products, Inc.,
- C. ACID COLOR STAIN includes but is not limited to the following as approved by sealer manufacturer.
 - 1. Dex-O-Tex Chem-Stain by Crossfield Products
 - 2. Ameripolish Dyes by Advanced Floor Products, Inc.,
- D. Preferred Applicators: must be approved by the manufacturer as specified herein, and include but are not limited to the following:

JC Decorative Concrete Ogden UT.

2.04 RELATED MATERIALS

- A. Neutralizing Agent: Tri-sodium Phosphate or as required by manufacturer
- B. Water:
 - 1. Potable

PART 3- EXECUTION

3.01 SURFACE CONDITIONS:

- A. Examine substrate, with installer present, for conditions affecting performance of finish. Correct conditions detrimental to timely and proper work. Do not proceed until unsatisfactory conditions are corrected.
- B. Prior to application, verify that floor surfaces are free of construction latents.

3.02 PREPARATION

- A. Remove existing floor adhesive by grinding with 30 grit metal bond diamond abrasives or equal.
- B. After removal of glue, grind with metal bond diamond pads If 30 grit 70 grit and 120 grit at a 50% overlap and a minimum of 4 passes per grit, with each pass in a different direction from the preceeding pattern.
- C. All edges must be ground with 120 grit to minimize grinding marks.
- D. Prepare cracks with crack chasing tools and fill with modified polyurethane sealant equal to Xtra Bond 9500.
- E. Patch defective slab areas with Rapid-set cement mixed with acrylic fortifier and water.

3.03 APPLICATION

- A. Start any of the floor finish applications in presence of manufacturer's technical representative.
- B. Stained Concrete Finish. 50, 100 and 200 grit grinding
 - 1. Bring concrete substrate up to 200 grit level as recommended by manufacturer.
 - 2. Four passes required of all grit levels to achieve 200 grit finish
 - 3. Apply acid stain, in color and patterns indicated in accordance with stain manufacturer's instructions. In Colors as selected by Architect.
 - 4. Cure stained surface in accordance with manufacturer's instructions.
 - 5. Neutralize stained concrete floor with neutralizing agent, and flush with water.
 - 6. Clean stained slab surfaces with auto scrubber
 - 7. Apply densifier - Consolidex LS or equal undiluted at a rate not less than 500 sq ft per gallon and allow to dry. Surface should remain wet for 5 minutes after application or re-application is required, prior to starting next grit.
- C. Honed and polished finish in accordance with manufacturer's instructions.
 - 1. Hone slab with 400 grit pads after densifier application is completed
 - 2. Polish with 800 grit pads with 2 passes at a minimum 50% overlap
- D. Clean floor with autoscrubber and allow to dry
- E. Apply 2 coats of gloss sealer protectant at a rate of 2000 square feet per gallon undiluted.
- F. Floor Surface Polishing :
 - 1. Burnish with 8500 grit pads or diamond impregnated burnishing pads

- 2, Hogs hair or synthetic burnishing pads are not acceptable

F. Borders

1. Provide consistent finish in all contiguous areas.
2. Finish edges of floor finish adjoining other materials in a clean and sharp manner.
3. Use epoxy sealers for boarder areas if shown

G. Application is to take place a minimum of 10 days prior to other installations, thus providing a complete, uninhibited concrete slab for application

1. Apply special concrete sealer finish in accordance with sealer manufacturer's instructions.

3.03 WORKMANSHIP AND CLEANING:

- A. The premises shall be kept clean and free of debris at all times.
- B. Remove spatter from adjoining surfaces, as necessary.
- C. Repair damages to surface caused by cleaning operations.
- D. Remove debris from jobsite
 1. Dispose of materials in separate, closed containers in accordance with local regulations.

3.04 PROTECTION:

- A. Protect finished work until fully cured in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 040120 - MASONRY CLEANING

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. Cleaning exposed masonry surfaces that become interior surfaces in the work
 - 2. Repair of existing brick damaged by new construction.
- B. Related Sections include the following:
 - 1. Division 7 Section "Sheet Metal Flashing and Trim" for metal flashing installed in or on clay masonry.
 - 2. Division 7 Section "Joint Sealants" for sealing joints in restored clay masonry.

1.3 DEFINITIONS

- A. Low-Pressure Spray: 100 to 400 psi (690 to 2750 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).

1.4 SUBMITTALS

- A. Product Data: For each product indicated. Include recommendations for application and use. Include test reports and certifications substantiating that products comply with requirements.
- 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. Cleaning program indicating cleaning process, including protection of surrounding materials on building and Project site, and control of runoff during operations. Describe in detail the materials, methods, and equipment to be used.
 - 1. If materials and methods other than those indicated are proposed for cleaning work, provide a written description, including evidence of successful use on other comparable projects, and a testing program to demonstrate their effectiveness for this Project.

1.5 QUALITY ASSURANCE

- A. Chemical Manufacturer Qualifications: A company regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory-

trained representatives who are available for consultation and Project site inspection and assistance at no additional cost.

- B. Mockups: Prepare field samples for restoration methods and cleaning procedures to demonstrate aesthetic effects and qualities of materials and execution. Use materials and methods proposed for completed Work and prepare samples under same weather conditions to be expected during remainder of Work.
 - 1. Locate mockups on the building where directed by Architect.
 - 2. Cleaning: Prepare sample approximately 8 sq. ft. in area for each type of clay masonry and surface condition.
 - a. Test cleaners and methods on samples of adjacent materials for possible adverse reactions, unless cleaners and methods are known to have a deleterious effect.
 - b. Allow a waiting period of not less than 7 days after completion of sample cleaning to permit a study of sample panels for negative reactions.
- C. Source of Materials: Obtain materials for masonry restoration from a single source for each type of material required (face brick, cement, sand, etc.) to ensure a match of quality, color, pattern, and texture.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver cleaning materials to Project site in manufacturer's original and unopened containers, labeled with type and name of products and manufacturers.
- B. Comply with manufacturer's written instructions for minimum and maximum temperature requirements for storage.

1.7 PROJECT CONDITIONS

- A. Clean masonry surfaces only when air temperature is 40 deg F (4 deg C) and above and will remain so for at least 7 days after completion of cleaning.

1.8 SEQUENCING AND SCHEDULING

- A. Order replacement materials at the earliest possible date, to avoid delaying completion of the Work.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS

- A. Water for Cleaning: Potable.
- B. Warm Water: Heat water to a temperature of 140 to 160 deg F (60 to 71 deg C).
- C. Job-Mixed Detergent Solution: Solution prepared by mixing 2 cups (0.5 L) of tetrasodium polyphosphate (TSPP), 1/2 cup (125 mL) of laundry detergent (Tide, All, etc.), 5 quarts (5 L) of 5

percent sodium hypochlorite (bleach), and 15 quarts (15 L) of warm water for each 5 gal. (20 L) of solution required.

- D. Nonacidic Liquid Cleaner: Manufacturer's standard mildly alkaline liquid cleaner formulated for removing mold, mildew, and other organic soiling from ordinary building materials, including polished stone, brick, aluminum, plastics, and wood.

1. **Available Products:**

- a. Dominion Restoration, Inc.; Bio-Cleanse.
- b. Dumond Chemicals, Inc.; Safe n' Easy Architectural Cleaner/Restorer.
- c. Price Research, Ltd.; Price Non-Acid Masonry Cleaner.
- d. ProSoCo; Enviro Klean Restoration Cleaner.

- E. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished stone surfaces from the damaging effects of acidic and alkaline masonry cleaners.

2.2 CHEMICAL CLEANING SOLUTIONS

- A. Dilute chemical cleaners with water to produce solutions of concentration recommended by chemical cleaner manufacturer, unless otherwise indicated.

2.3 MISCELLANEOUS MATERIALS

- A. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished stone surfaces from damaging effects of acidic and alkaline masonry cleaners.

1. **Available Products:**

- a. American Building Restoration Products, Inc.; LM 130 Acid Shield.
- b. Diedrich Technologies Inc.; Diedrich Acid Guard.
- c. Price Research, Ltd.; Price Mask.
- d. ProSoCo; Sure Klean Strippable Masking.

PART 3 - EXECUTION

3.1 PREPARATION

- A. General: Comply with chemical cleaner manufacturer's written instructions for protecting building surfaces against damage from exposure to their products.

- B** Protect adjacent surfaces from contact with chemical cleaners by covering them with a liquid strippable masking agent or polyethylene film and waterproof masking tape. Apply masking agent to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces.

- C Verify that cars are not in danger of exposure to chemicals, prior to start of work.

- D. Establish watertight retainage procedures for interior work prior to start of work.

3.2 CLEANING MASONRY, GENERAL

- A. Proceed with cleaning in an orderly manner; work from top to bottom and from one end of each elevation to the other
- B. Use only those cleaning methods indicated for each masonry material and location.
 - 1. Use natural-fiber brushes only.
 - 2. Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage masonry.
 - a. Equip units with pressure gages.
 - 3. For chemical cleaner spray application, use a low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with a cone-shaped spray tip.
 - 4. For water spray application, use a fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
- C. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, and that produces an even effect without streaking or damaging masonry surfaces. Contain and remove all run-off generated by cleaning to avoid damage to adjacent interior spaces
- D. Water Application Methods: Where water application methods are required, comply with the following:
 - 1. Spray Applications: Spray apply water to masonry surfaces to comply with requirements indicated for location, purpose, water temperature, pressure, volume, and equipment. Unless otherwise indicated, hold spray nozzle at least **6 inches (150 mm)** from surface of masonry and apply water from side to side in overlapping bands to produce uniform coverage and an even effect.
- E. Chemical Cleaner Application Methods: Apply chemical cleaners to masonry surfaces to comply with chemical cleaner manufacturer's written instructions; use brush or spray application methods, at Contractor's option, unless otherwise indicated. Do not allow chemicals to remain on surface for periods longer than those indicated or recommended by manufacturer.
 - 1. Spray Application: Apply chemical cleaners at pressures not exceeding **50 psi (345 kPa)**, unless otherwise indicated.
 - 2. Reapplying Chemical Cleaners: Do not apply chemical cleaners to same masonry surfaces more than twice. If additional cleaning is required, use a steam wash.
- F. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting.

3.3 CLEANING MASONRY

- A. At Contractor's option provide the cleaning method best suited to application within new construction area, utilize warm or cold water wash, pressure as required and cleaners if any are required to clean existing surfaces

3.4 BRICK RESTORATION

- A. Where existing brick are damaged by new construction , replace or restore to match adjacent undamaged brick that remain

3.5 CLEAN-UP

- A. Contain all run-off and remove from site by approved methods. Use sheeting to contain over-spray and dispose of sheeting if cleaner residue is considered caustic or hazardous materials.

END OF SECTION 040120

SECTION 042000 – 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. CMU
 - 2. Precast trim.
 - 3. Mortar and grout.
 - 4. Reinforcing steel.
 - 5. Masonry joint reinforcement.
 - 6. Ties and anchors.
 - 7. Miscellaneous masonry accessories.
 - 8. Through wall flashing
- B. Related Sections include the following:
 - 1. Division 7 Section "Joint Sealers" for joint sealers in control joints to match masonry unit colors or as scheduled.
 - 2. Division 7 Section "Air Barriers" for product applied to sheathing prior to cavity insulation.
 - 3. Division 7 Section "Sheet Metal Flashing and Trim" for sheet metal flashing installed in masonry joints.
 - 4. Division 6 "Panel Sheathing" for substrate behind brick veneer.
- C. Products installed, but not furnished, under this Section include the following:
 - 1. Steel lintels and relieving angles for unit masonry, furnished under Division 5 Section "Metal Fabrications."
 - 2. Hollow-metal frames in unit masonry openings, furnished under Division 8 Section "Steel Doors and Frames."

1.3 PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops the following net-area compressive strengths (f'm) at 28 days. Determine compressive strength of masonry from net-area compressive strengths of masonry units and mortar types according to Tables 2105.2.2.1.1 and 2105.2.2.1.2 in IBC 2012 or the prism test method section 2105.2.2.2 in IBC 2012.
 - 1. For Concrete Unit Masonry: as shown in the Structural Drawings

1.4 ACTION 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." Show elevations of reinforced walls.
 2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
 3. Precast and custom brick shape trim
- C. Samples for Initial Selection: For the following:
1. Unit masonry Samples in small-scale form showing the full range of colors and textures available for each different exposed masonry unit required.
 2. Mortar Samples showing the full range of natural colored mortar available.
- D. Samples for Verification: For the following:
1. Full-size units for each different exposed masonry unit required, showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
 2. Mortar Samples. Make samples using the same sand and mortar ingredients to be used on Project
 3. Weep holes/vents in color to match mortar color.
 4. Accessories embedded in the masonry.

1.5 INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
- 1 Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents, unless such deviations are specifically brought to the attention of the Architect and approved in writing.
- B. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- 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 size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
 - b. Include test results, measurements, and calculations establishing net-area compressive strength of masonry units.

2. Mortar complying with property requirements of ASTM C270.
 3. Grout mixes complying with compressive strength requirements of ASTM C 476
 4. 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 size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
 - b.. 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.

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. 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.
- E. 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 mockup of typical wall areas for interior wainscot, exterior wall and all products as shown on Drawings.
 3. Build mockups for the following types of masonry in sizes approximately 48 inches (1200 mm) long by 48 inches (1200 mm) high by full thickness, including face and backup

wythes and accessories. Include a sealant-filled joint at least **16 inches (400 mm)** long in each mockup.

- a. Typical exterior wall with corner of window opening framed with custom shapes. Make opening approximately **12 inches (300 mm)** wide by **16 inches (400 mm)** high.
 - b. Typical exterior wall with through-wall flashing installed for a **24-inch (600-mm)** length in corner of mockup approximately **16 inches (400 mm)** down from top of mockup, with a **12-inch (300-mm)** length of flashing left exposed to view (omit masonry above half of flashing), complete with metal studs, sheathing, veneer ties, flashing, and weep holes and anti-graffiti coating/water repellant applied to surface of masonry.
4. Clean exposed faces of mockups with masonry cleaner as indicated.
 5. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 6. Protect accepted mockups from the elements with weather-resistant membrane.
 7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 8. 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 is also for other material and construction qualities specifically approved by Architect in writing.
 - b. 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.
 9. Demolish and remove mockups when directed.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

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.
10. Protect Type I concrete masonry units from moisture absorption so that, at the time of installation, the moisture content is not more than the maximum allowed at the time of delivery.
- 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. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 PROJECT CONDITIONS

- A. Protection of Masonry: For walls exposed to elements, during construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1 Extend cover a minimum of 24 inches (600 mm) down both sides and hold cover securely in place.
- 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.
- D. 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 deg F (38 deg C), or 90 deg F (32 deg C) with a wind velocity greater than 8 mph (13 km/h), do not spread mortar beds more than 48 inches (1200 mm) ahead of masonry. Set masonry units within one minute of spreading mortar.
- E. 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 contained in ACI 530.1/ASCE 6/TMS 602 and the Building Code.
 - 1 Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

B. REQUIREMENTS FOR MASONRY CONSTRUCTION IN COLD WEATHER

Temperature (see note)	Construction Requirements	Protection Requirements
100 °F - 40 °F (38 °C - 4 °C)	Normal procedures.	Cover walls with plastic or canvas at end of work day to prevent water from entering masonry.
40 °F - 32 °F (4 °C - 0 °C)	Heat mixing water or sand to produce mortar between 40 °F - 120 °F (4 °C - 49 °C).	Completely cover newly constructed masonry with a weather resistant membrane for 48 hr after construction.
32 °F-25 °F (0 °C - -4 °C)	Heat mixing water and sand to produce mortar between 40 °F - 120 °F (4 °F - 49 °C). Heat grout materials so grout is placed at a temperature between 40 °F - 120 °F (4 °C - 49 °C) Maintain mortar and grout above freezing until used in masonry.	Completely cover newly constructed masonry with a weather resistant membrane for 48 hr after construction.
25 °F - 20 °F (-4 °C - -7 °C)	Heat mixing water and sand to produce mortar between 40 °F - 120 °F (4 °C - 49 °C). Heat grout materials so grout is placed between 40 °F - 120°F (4 °C - 49 °C). Maintain mortar and grout above freezing. Heat masonry units to 40 °F (4 °C) if grouting. Use heat sources on both sides of walls under construction.	Completely cover newly constructed masonry with insulating blankets or equal protection for 48 hr to prevent freezing. Install wind breaks when wind velocity exceeds 15 mph (6.7 m/s).
20 °F and Below (-7 °C and Below)	Heat mixing water and sand to produce mortar between 40 °F - 120 °F (4 °C - 49 °C). Heat grout materials so grout is placed between 40 °F - 120 °F (4 °C - 49 °C). Heat masonry units to 40 °F (4 °C). Use heat sources on both sides of walls under construction. Provide enclosure and heat to maintain temperatures above 32 °F (0 °C) within the enclosure.	Provide enclosure and heat to maintain temperatures above 32 °F (0 °C) within the enclosure for 48 hr after construction. Heat may be provided by electric heating blankets, infrared heat lamps or other approved methods.

PART 2 - PRODUCTS

2.1 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. All outside corners of exposed units to be factory fabricated bullnose configuration.

B Concrete Masonry Units: ATM C 90 and as follows:

1. Unit Compressive Strength: Per General Structural Notes.
2. Weight Classification: Normal weight.
3. 1 hour rated where indicated
4. Size (Width): Manufactured to the following dimensions:
 - a. 8 inches; 7-5/8 inches actual.
5. Exposed Faces As scheduled. 2 colors split faced

2.2 PRECAST TRIM UNITS

- A. 5000 PSI Architectural Concrete in shapes as shown.
 1. Description: Color and finish as directed by Architect.
- B. Provide units accurately shaped, with exposed faces dressed true.

2.3 MORTAR AND GROUT MATERIALS

- 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.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification.
 1. Limit cementitious materials in mortar to portland cement, mortar cement, and lime.
 2. For reinforced masonry and where indicated, use Type S.
 3. For interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type S.
- D. Colored Cement Product: Packaged blend made from masonry cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
 1. Formulate blend as required to produce color as selected by Architect.
 2. Pigments shall not exceed 5 percent of masonry cement by weight.
 3. Available Products:
 - a. Colored Masonry Cement:
 - 1) Capital Materials Corporation; Flamingo Color Masonry Cement.
 - 2) Essroc, Italcementi Group; Brixment-in-Color.
 - 3) Holcim (US) Inc.; Rainbow Mortamix Custom Color Masonry Cement.
 - 4) Lafarge North America Inc.; Florida Custom Color Masonry or Magnolia Masonry Cement.
 - 5) Lehigh Cement Company; Lehigh Custom Color Masonry Cement.

6) National Cement Company, Inc.; Coosa Masonry Cement.

E. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve

F. Aggregate for Grout: ASTM C 404.

G. Water: Potable.

2.4 EMBEDDED FLASHING MATERIALS

A Metal Flashing: Provide metal flashing and membrane waterproofing materials complying with SMACNA's "Architectural Sheet Metal Manual" and Division 07 Section "Sheet Metal Flashing and Trim" and as follows:

1. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees and hemmed.
2. Fabricate through-wall flashing with sealant stop where indicated. Fabricate by bending metal back on itself 3/4 inch (19 mm) at exterior face of wall and down into joint 1/4 inch (6 mm) to form a stop for retaining sealant backer rod.

B Application: Unless otherwise indicated, use the following:

3. Where flashing is indicated to receive counterflashing, use metal flashing.
4. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
5. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge unless otherwise indicated.
6. Where flashing is fully concealed, use metal flashing.

C. For flashing, use the following, unless otherwise indicated:

1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch (0.4 mm) thick.
2. Fabricate through-wall metal flashing embedded in masonry from stainless steel with ribs at 3-inch (75-mm) intervals along length of flashing to provide an integral mortar bond.

a. Available Products:

- 1) Cheney Flashing Company; Cheney Flashing (Dovetail or Cheney 3-Way Flashing (Sawtooth).
- 2) Keystone Flashing Company, Inc.; Keystone 3-Way Interlocking Thruwall Flashing

D 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\

2.5 REINFORCING STEEL

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

2.6 TIES AND ANCHORS, GENERAL

- A. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, unless otherwise indicated.
- B. Hot-Dip Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.
- C Galvanized Steel Sheet: ASTM A 653/A 653M, G60 (Z180), commercial-quality, steel sheet zinc coated by hot-dip process on continuous lines before fabrication.
- D Connector Section for Concrete: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.053-inch- (1.3-mm-) thick, steel sheet, galvanized after fabrication

2.7 MISCELLANEOUS ANCHORS

- A. 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. 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).
 - i. For Postinstalled Anchors in Concrete: Capability to sustain, without failure, a load equal to four times the loads imposed.
 - ii. For Postinstalled Anchors in Grouted Masonry Units: Capability to sustain, without failure, a load equal to six times the loads imposed.

2.8 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, urethane or PVC.
- B. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- C. Plastic Weep/Vent: Medium-density polyethylene, 3/8-inch thick for installation in head joints.
- D. Cavity Drainage Material: thickness to match cavity dimension, free-draining mesh; made from polyethylene strands and shaped to avoid being clogged by mortar droppings.
- E. Available Products: Subject to compliance with requirements, cavity drainage materials that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Plastic Weep Vent:
 - Cell Vent; Dur-O-Wal, Inc.
 - 2. Cavity Drainage Material:

Mortar Break; Advanced Building Products, Inc.
CavClear Masonry Mat; CavClear.
Mortar Net; Mortar Net USA, Ltd.
Mortar Stop; Polyrite Manufacturing Corp.

2.9 MASONRY CLEANERS

- A. Job-Mixed Detergent Solution: Solution of 1/2-cup (0.14-L) dry measure tetrasodium polyphosphate and 1/2-cup (0.14-L) dry measure laundry detergent dissolved in 1 gal. (4 L) 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.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification.
1. Limit cementitious materials in mortar to portland cement, mortar cement, and lime.
 2. Use Type S for reinforced masonry and interior non-load bearing partitions.
- D. Grout for Unit Masonry: Comply with ASTM C 476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 5 of ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 2. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C 143.

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 reinforcing dowels are properly placed.
 3. 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 piping connections.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown.
- 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. Wetting of Brick: Wet brick before laying if the initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) 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.

3.3 CONSTRUCTION TOLERANCES

- A. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:
- B. 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 (6 mm in 6 m), nor 1/2 inch (12 mm) maximum.
- C. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), nor 1/2 inch (12 mm) maximum.
- D. 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 (6 mm in 6 m), nor 1/2 inch (12 mm) maximum.
- E. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm). Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
- F. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/16 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/16 inch (3 mm).

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 (100-mm)** horizontal face dimensions at corners or jambs.
 - 1. As indicated on Drawings.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than **2 inches (50 mm)**. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal **4-inch (100-mm)** 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.

3.4 MORTAR BEDDING AND JOINTING

- A. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than the joint thickness, unless otherwise indicated.
- B. Set trim units in full bed of mortar with vertical joints slushed full. Fill dowel, anchor, and similar holes solid. Wet stone-joint surface thoroughly before setting; for soiled surfaces, clean bedding and exposed surfaces with fiber brush and soap powder and rinse thoroughly with clear water

3.5 ANCHORING MASONRY VENEERS

- A. Anchor masonry veneers to wall framing with seismic masonry-veneer anchors to comply with the following requirements:
 - 1. Fasten each anchor section through sheathing to wall framing with two metal fasteners of type indicated.
 - 2. Embed connector sections and continuous wire in masonry joints. Provide not less than the dimensioned air space as shown between back of masonry veneer and face of sheathing.
 - 3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 - 4. Space anchors as indicated, but not more than **16 inches (406 mm)** o.c. vertically and **16 inches (610)** o.c. horizontally with not less than 1 anchor for each **3.5 sq. ft. (0.33 sq. m)** of wall area. Install additional anchors within **12 inches (305 mm)** of openings and at intervals, not exceeding **36 inches (914 mm)**, around perimeter.

3.6 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
 - 1. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
 - 2. Install preformed control-joint gaskets designed to fit standard sash block.
 - 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
 - 4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.
- C. Form expansion joints in brick made from clay or shale as follows:
 - 1. Build in compressible joint fillers where indicated.
 - 2. Form open joint full depth of brick wythe and of width indicated, but not less than **3/8 inch (10 mm)** for installation of sealant and backer rod specified in Division 7 Section "Joint Sealants."

3.7 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 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. Where amount of staining is severe, or detergent cleaning is ineffective, Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions

3.8 MASONRY WASTE DISPOSAL

- A. Recycling: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

END OF SECTION 042000

SECTION 051200 - STRUCTURAL STEEL

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 fabrication and erection of structural steel work as shown on the plan drawings, including schedules, notes, and details showing size and location of members, typical connections, and types of steel required.
 - 1. Structural steel is that work defined in American Institute of Steel Construction (AISC) "Code of Standard Practice" and as otherwise shown on drawings.

1.3 ACTION SUBMITTALS.

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Shop drawings prepared 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. Indicate welds by standard AWS symbols and show size, length, and type of each weld.
 - 2. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of other sections.
- A. 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 whether prequalified or qualified by testing, including the following:
 - 1. Power source (constant current or constant voltage).
 - 2. Electrode manufacturer and trade name, for demand critical welds.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator and testing agency.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural steel, including chemical and physical properties.
- E. Product Test Reports: For the following:

1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 2. Direct-tension indicators.
 3. Tension-control, high-strength, bolt-nut-washer assemblies.
 4. Shear stud connectors.
 5. Shop primers.
 6. Nonshrink grout.
- F. Survey of existing conditions.
- G. Source quality-control reports.
- H. Field quality-control and special inspection reports.

1.5 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of following, except as otherwise indicated:
1. American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges," excluding the following Sections: 1.5.1; 3.3 (first sentence); 4.2; 4.2.1; 4.2.2; 7.5.4; and 7.11.5.
 2. AISC "Specifications for Structural Steel Buildings," including "Commentary."
 3. "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Structural Connections.
 4. American Welding Society (AWS) D1.1 "Structural Welding Code - Steel."
 5. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use."
- B. Qualifications for Welding Work: Qualify welding procedures and welding operators in accordance with AWS "Qualification" requirements.
1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests within the previous 12 months.
 2. If recertification of welders is required, retesting will be Contractor's responsibility.
 3. Submit Written Welding Procedure for all weld types.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site at such intervals to ensure uninterrupted progress of work.
- B. 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.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. If bolts and nuts become dry or rusty, clean and relubricate before use.
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.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Metal Surfaces, General: For fabrication of work that will be exposed to view, use only materials that 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 applying surface finishes.
- B. Structural Steel Shapes, Plates, and Bars: ASTM A 36, unless otherwise indicated.
- C. Wide Flange Beams and Purlins: ASTM A-992, 50 Ksi unless noted otherwise.
- D. Cold-Formed Steel Tubing: ASTM A 500, Grade B, 46 ksi unless otherwise indicated.
- E. Steel Pipe: ASTM A 53, Type E or S, Grade B.
- F. Deformed Bar Anchors: ASTM A 496.
- G. Headed Stud Anchors: ASTM A 108 with dimensions complying with AISC Specifications.
- H. Anchor Bolts: Material specifications in accordance with the structural drawings, unless otherwise indicated.
- I. 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. Hardened washers or plates installed over oversized holes or slotted holes shall conform to ASTM F436, and where required in the structural drawings.
- J. Direct Tension Indicators: ASTM F 959, type as required.
 - 1. Use at Contractor's option.
- K. Electrodes for Welding: Comply with AWS Code and General Structural Notes on Drawings.
- L. Structural Steel Primer Paint: Rust-inhibiting alkyd-based primer paint.
- M. Non-metallic Shrinkage-Resistant Grout: Premixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with CE-CRD-C621.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Sure Grip Grout; Dayton Superior.
 - b. Euco N.S.; Euclid Chemical Co.
 - c. Crystex; L & M Construction Chemicals, Inc.
 - d. Masterflow 713; Master Builders.
 - e. Sealtight 588 Grout; W. R. Meadows.
 - f. Propak; Protex Industries, Inc.
 - g. Five Star Grout; U.S. Grout Corp.

*Non-shrink grout shall be installed in accordance with manufacturers specifications.
Approved ICC reports shall be submitted to architect and engineer for review.

2.2 FABRICATION

- A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.
 - 1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.
 - 2. 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.
- B. Connections: Weld or bolt shop connections, as indicated.
- C. Bolt field connections, except where welded connections or other connections are indicated.
 - 1. Provide high-strength threaded fasteners for all steel-to-steel bolted connections.
- D. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts."
- E. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.
- F. Holes for Other Work: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on final shop drawings.
- G. Provide threaded nuts welded to framing and other specialty items as indicated to receive other work.
- I. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.3 SHOP PAINTING

- A. General: Shop-paint structural steel, except those members or portions of members to be embedded in concrete or mortar.
 - 1. Do not paint surfaces to be welded or high-strength bolted with friction-type connections.
 - 2. Do not paint surfaces indicated to receive sprayed-on fireproofing.
- B. Surface Preparation: After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:
 - 1. SP-2 "Hand-Tool Cleaning."
- C. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 1.5 mils. Use painting methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.4 SOURCE QUALITY CONTROL

- A. General: 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 that do not comply.
- B. 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.
 - 1. Promptly notify Architect whenever design of members and connections for any portion of structure are not clearly indicated.

PART 3 - EXECUTION

3.1 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.
- B. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.
- C. 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.
 - 2. 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.
 - 3. 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.
 - 4. For proprietary grout materials, comply with manufacturer's instructions.
- D. 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 that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
- E. Level and plumb individual members of structure within specified AISC tolerances.
- F. 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.
- G. Splice members only where indicated and accepted on shop drawings.
- H. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

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

3.2 FIELD QUALITY CONTROL

- A. Owner will engage an independent testing and inspecting agency to perform field inspections and tests 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 requirements.
- B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
- C. Additional testing will be required on deficient work to determine compliance of corrected Work with specified requirements.

3.3 CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.
 - 1. Apply by brush or spray to provide a minimum dry film thickness of 1.5 mils (0.038 mm).

END OF SECTION

SECTION 055000 - 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. Loose bearing and leveling plates.
 - 2. Loose steel lintels.
 - 3. Steel framing and supports for mechanical and electrical equipment.
 - 4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
- B. Related Sections include the following:
 - 1. Division 5 Section "Structural Steel" for structural-steel framing system components.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Paint products.
 - 2. Grout.
 - 3. Non-slip aggregates and finishes.
- B. Shop Drawings: 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. Mill Certificates: Signed by manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.
- 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.

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 D1.3, "Structural Welding Code--Sheet Steel."
 - 3. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.5 PROJECT CONDITIONS

- A. Field Measurements: 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.

1.6 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.

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.

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.
- D. Malleable-Iron Castings: **ASTM A 47, Grade 32510** (ASTM A 47M, Grade 22010).

- E. Gray-Iron Castings: **ASTM A 48, Class 30** (**ASTM A 48M, Class 200**), unless another class is indicated or required by structural loads.
- F. 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** (**ASTM A 47M**) malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.
- G. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.3 PAINT

- A. Shop Primers: Provide primers that comply with Division 9 Section "Painting."
- B. 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.

Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

- a. Carboline 621; Carboline Company.
 - b. Aquapon Zinc-Rich Primer 97-670; PPG Industries, Inc.
 - c. Tneme-Zinc 90-97; Tnemec Company, Inc.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalanizing 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.

2.4 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** (**ASTM F 568M, Property Class 4.6**); with hex nuts, **ASTM A 563** (**ASTM A 563M**); and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F 1554, Grade 36.
- D. Machine Screws: **ASME B18.6.3** (**ASME B18.6.7M**).
- E. Lag Bolts: **ASME B18.2.1** (**ASME B18.2.3.8M**).
- F. Wood Screws: Flat head, carbon steel, ASME B18.6.1.

- G. Plain Washers: Round, carbon steel, **ASME B18.22.1** (**ASME B18.22M**).
- H. Lock Washers: Helical, spring type, carbon steel, **ASME B18.21.1** (**ASME B18.21.2M**).
- 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.
 - 2. Material: Alloy Group 1 or 2 stainless-steel bolts complying with **ASTM F 593** (**ASTM F 738M**) and nuts complying with **ASTM F 594** (**ASTM F 836M**).
- J. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as needed.

2.5 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.

2.6 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** (**1 mm**), 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 deg F (67 deg C), ambient; 180 deg F (100 deg C), 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.

2.7 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.

2.8 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 indicated.
- 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 (200 mm), unless otherwise indicated.
- D. Galvanize loose steel lintels located in exterior walls.

2.9 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. Where units are indicated to be built into masonry, equip with integrally welded steel strap anchors 1-1/4 inches (32 mm) wide by 1/4 inch (6 mm) thick by 8 inches (200 mm) long at 24 inches (600 mm) o.c., unless otherwise indicated.
 - 2. Furnish inserts if units must be installed after concrete is placed.

2.10 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.

2.11 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/A 153M, 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. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- C. 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.

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 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 nonshrink nonmetallic grout, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 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. Anchor supports securely to and rigidly brace from building structure.

3.4 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 (0.05-mm) 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 055000

SECTION 055213 - 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 the following:
 - 1. Steel handrails and railing systems. Galvanized and painted at exterior applications.
- B. Related Sections:
 - 1. Division 9 Section for Field applied finish

1.3 DEFINITIONS

- A. Definitions in ASTM E 985 for railing-related terms apply to this Section.

1.4 PERFORMANCE REQUIREMENTS

- A. General: In engineering handrail and railing systems to withstand structural loads indicated, determine allowable design working stresses of materials based on the following:
 - 1. Cold-Formed Structural Steel: AISI "Specification for the Design of Cold-Formed Steel Structural Members."
- B. Structural Performance of Handrails and Railing Systems: Engineer, fabricate, and install handrails and railing systems to withstand the following structural loads without exceeding the allowable design working stress of the materials for handrails, railing systems, anchors, and connections. Apply each load to produce the maximum stress in each of the respective components comprising handrails and railing systems.
 - 1. Top Rail of Guardrail Systems: Capable of withstanding the following loads applied as indicated:
 - a. Concentrated load of 300 lbf (890 N) applied at any point and in any direction.
 - b. Uniform load of 50 lbf per linear foot (730 N/m) applied horizontally and concurrently with uniform load of 100 lbf per linear foot (1460 N/m) 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 (890 N) applied at any point and in any direction.
 - b. Uniform load of 50 lbf per linear foot (730 N/m) applied in any direction.

- c. Concentrated and uniform loads above need not be assumed to act concurrently.
- 3. Infill Area of Guardrail Systems: Capable of withstanding a horizontal concentrated load of 200 lbf (890 N) applied to 1 sq. ft. (0.09 sq. m) at any point in the system including panels, intermediate rails, balusters, or other elements composing the infill area.
 - a. Above load need not be assumed to act concurrently with loads on top rails of railing systems in determining stress on guard.

1.5 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of mechanically connected railings.
 - 2. Railing brackets.
 - 3. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Verification: For each type of exposed finish required.
 - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
- D. 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.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified **professional engineer**.
- B. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- C. Welding certificates.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

1.7 QUALITY ASSURANCE

- A. Engineer Qualifications: Professional engineer legally authorized to practice in the jurisdiction where Project is located and experienced in providing engineering services of the kind indicated.
- B. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel."

1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests within the previous 12 months.
 2. If recertification of welders is required, retesting will be Contractor's responsibility.
- C. Adhesives and Sealants: For field applications that are inside the weatherproofing system, comply with the VOC content limits noted in Section 018113 "Sustainable Design Requirements".
- D. Paints and Coatings: For field applications that are inside the weatherproofing system, comply with the VOC content limits noted in Section 018113 "Sustainable Design Requirements".
- E. Recycled Content of Steel Products: Provide steel products with postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

1.8 STORAGE

- A. Store handrails and railing systems inside a well-ventilated area, away from uncured concrete and masonry and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity.

1.9 PROJECT CONDITIONS

- A. Field Measurements: Where handrails and railing systems are indicated to fit to other construction, check actual dimensions of other construction by accurate field measurements before fabrication; show recorded measurements on final 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 dimensions and proceed with fabricating handrails and railing systems without field measurements. Coordinate other construction to ensure that actual dimensions correspond to guaranteed dimensions.

PART 2 - PRODUCTS

2.1 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 and Iron: Provide steel and iron in the form indicated, complying with the following requirements:
1. Steel Tubing: Product type (manufacturing method) and as follows:
 - a. Cold-Formed Steel Tubing: ASTM A 500.
- C. Brackets, Flanges, and Anchors: Cast or formed metal of the same material and finish as supported rails, unless otherwise indicated.

2.2 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 and as required for color match, strength, and compatibility in fabricated items.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of the type, grade, and class required to produce connections that are suitable for anchoring railings to other types of construction indicated and capable of withstanding design loadings.
 - 1. For steel railings and fittings, use plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
 - 2. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.
- C. Cast-in-Place and Postinstalled Anchors: Anchors of type indicated below, fabricated from corrosion-resistant materials, capable of sustaining, 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. Cast-in-place anchors.
 - 2. Chemical anchors.

2.3 PAINT

- A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer, 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, complying with performance requirements of FS TT-P-664.
- B. Field Finish painting in Division 9 Section.

2.4 ANCHORING CEMENT

- A. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without need for protection by a sealer or waterproof coating and is recommended for exterior use by manufacturer.
- B. Products: Subject to compliance with requirements, provide one of the following or equal:
 - 1. Erosion-Resistant Anchoring Cement:
 - a. Bonsal Anchor Cement; W.R. Bonsal Co.
 - b. Super Por-Rok; Minwax Construction Products Division.

2.5 FABRICATION

- A. General: Fabricate handrails and railing systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of hollow

members, post spacings, and anchorage, but not less than those required to support structural loads.

- B. Assemble handrails and railing systems 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. Clearly mark units for reassembly and coordinated installation.
- C. Form changes in direction of members as follows:
 - 1. By radius bends of radius indicated.
- D. Form curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of pipe throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of pipe.
- E. Welded Connections: Fabricate handrails and railing systems for connection of members by welding. For connections made during fabrication, 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 tee and cross intersections, cope ends of intersecting members to fit contour of pipe or tube to which end is joined, and weld all around.
 - 5. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- F. Brackets, Flanges, Fittings, and Anchors: Provide manufacturer's standard wall brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing system members to other construction.
- G. Provide inserts and other anchorage devices to connect handrails and railing systems to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railing systems. Coordinate anchorage devices with supporting structure.
- H. For railing posts set in concrete, provide preset sleeves of steel, not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (12 mm) greater than outside dimensions of post, and steel plate forming bottom closure.
- I. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.
- J. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to the smallest radius possible without causing grain separation or otherwise impairing work.
- K. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.
- L. Provide weepholes, or another means to evacuate entrapped water, in hollow sections of railing members that are exposed to exterior or to moisture from condensation or other sources.

- M. Fabricate joints that will be exposed to weather in a manner to exclude water.
- N. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Cap all railing returns.
- O. Fillers: Provide steel sheet or plate fillers, of thickness and size indicated or required to support structural loads of handrails, where needed to transfer wall bracket loads through

wall finishes to structural supports. Size fillers to suit wall finish thicknesses to produce adequate bearing to prevent bracket rotation and overstressing substrate.

2.6 FINISHES, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

2.7 STEEL FINISHES

- F. Galvanized Railings:
 - 1. Hot-dip galvanize exterior steel and iron railings, including hardware, after fabrication.
 - 2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
 - 3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
- G. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- H. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- I. 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. Interiors (SSPC Zone 1A): SSPC-SP 7, "Brush-off Blast Cleaning."
- J. Apply shop primer to prepared surfaces of handrail and railing components, 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.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installing anchorages, such as sleeves, concrete inserts, anchor bolts, and miscellaneous items having integral anchors, that are to be embedded in concrete as masonry construction. Coordinate delivery of such items to Project site.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections accurately together to form tight, hairline joints.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing handrails and railing systems. Set handrails and railing systems 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 handrails and railing components that have been coated or finished after fabrication and are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/4 inch in 12 feet (2 mm in 1 m).
 - 3. Align rails so that 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 (2 mm in 1 m).
- 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 that no roughness shows after finishing, and welded surface matches contours of adjoining surfaces.
- D. Adjust handrails and railing systems prior to anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated but not less than that required by design loadings.
- E. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing handrails and railing systems 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 by welding. Cope or butt components to provide 100 percent contact, or use fittings designed for this purpose.

3.4 ANCHORING POSTS

- A. Anchor posts in concrete with pipe sleeves preset and anchored into concrete. After posts have been inserted into sleeves, solidly fill annular space between post and sleeve with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's directions.
 - 1. Anchoring cement.
- B. Leave anchorage joint exposed, wipe off surplus anchoring material, and leave 1/8-inch (3-mm) buildup, sloped away from post.
- C. Where anchoring to steel weld base flanges to supporting structure.

3.5 ATTACHING RAILINGS

A. Attach railings to wall with wall brackets, **except where end flanges are used**. Provide brackets with **1-1/2-inch (38-mm)** clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

1. Use type of bracket with **predrilled hole for exposed bolt anchorage**.
2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

B. Secure wall brackets and railing end flanges to building construction as follows:

1. For 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 partitions, use hanger or lag bolts set into **fire-retardant-treated** wood backing between studs. Coordinate with stud installation to locate backing members.
4. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.

3.6 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 same material as used for shop painting to comply with SSPC-PA 1 requirements for touch-up of field painted surfaces.

3.7 PROTECTION

- A. Protect finishes of handrails and railing systems 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 that 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.

END OF SECTION 055213

SECTION 061000 - 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. Wood nailers, and blocking.
 - 2. Backing panels for equipment

1.3 DEFINITIONS

- A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise specified.
- B. Exposed Framing: Dimension lumber not concealed by other construction and indicated to receive a stained or natural finish.

1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility for Engineered Wood Products: Obtain each type of engineered wood product from one source and by a single manufacturer.

1.5 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 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Wood-Preservative-Treated Materials:
 - a. Baxter: J. H. Baxter Co.
 - b. Chemical Specialties, Inc.

- c. Continental Wood Preservers, Inc.
- d. Hickson Corp.
- e. Hoover Treated Wood Products, Inc.
- f. Osmose Wood Preserving, Inc.

2.2 LUMBER, GENERAL

- A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.
- B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:
 - 1. WCLIB - West Coast Lumber Inspection Bureau.
 - 2. 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.
- D. 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 (38-mm actual)** thickness or less, unless otherwise indicated.

2.3 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 AWPAC2 (lumber) and AWPAC9 (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.
- B. Pressure treat aboveground items with waterborne preservatives to a minimum retention of **0.25 lb/cu. ft. (4.0 kg/cu. m)**. 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.
 - 3. Wood floor plates installed over concrete slabs directly in contact with earth.
- C. Pressure treat wood members in contact with ground or freshwater with waterborne preservatives to a minimum retention of **0.40 lb/cu. ft. (6.4 kg/cu. m)**.
- D. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with AWPAC4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

2.4 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. 2 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.

2.5 WOOD-BASED STRUCTURAL-USE PANELS, GENERAL

- A. Structural-Use Panel Standards: Provide either all-veneer, mat-formed, or composite panels complying with DOC PS 2, "Performance Standard for Wood-Based Structural-Use Panels," unless otherwise indicated. Provide plywood panels complying with DOC PS 1, "U.S. Product Standard for Construction and Industrial Plywood," where plywood is indicated.
- B. Trademark: Factory mark structural-use panels with APA trademark evidencing compliance with grade requirements.

2.6 STRUCTURAL-USE PANELS FOR BACKING

- A. Plywood Backing Panels: 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 (11.9 mm) thick.

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. Where rough 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. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M)
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

2.8 MISCELLANEOUS MATERIALS

- A. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbonate (IPBC) as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Discard units of material with defects that impair quality of rough carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.
- C. Fit rough 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 rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
- F. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.
- G. Use hot-dip galvanized or stainless-steel nails where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity.
- H. Countersink nail heads on exposed carpentry work and fill holes with wood filler.

3.2 WOOD NAILERS AND BLOCKING

- A. Install wood, nailers, and blocking, where shown and where required for screeding or attaching other work. Form to shapes shown and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

3.3 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.

- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Plywood Backing Panels: screw to supports.

END OF SECTION

SECTION 064023 – INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

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.

2. SUMMARY

- A. This Section includes the following:
 - 1. Plastic-laminate cabinets.
 - 2. Solid Surface Countertops
 - 3. Resin Panel accents
- B. Related Sections include the following:
 - 1. Division 6 Section "Rough Carpentry" for wood furring, blocking, shims, required for installing woodwork.
 - 2. Other Division 6 Section for Plastic Laminate faced Paneling

3. DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items, unless concealed within other construction before woodwork installation.

4. ACTION SUBMITTALS

- A. Product Data: For multi core panel products, plywood, high-pressure decorative laminate, adhesive for bonding plastic laminate, thermoset decorative overlay, fire-retardant-treated materials, cabinet hardware and accessories
 - 1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show details full size.
 - 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 3. Show locations and sizes of cutouts and holes for fixtures and other items installed in architectural woodwork.
- C. Samples for Initial 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 material indicated.
 - 1. Plastic laminates.
 - 2. Thermoset polyester overlays.
 - 3. Veneer leaves representative of and selected from flitches to be used for transparent-finished woodwork.

4. Wood-veneer-faced panel products with or for transparent finish, **8 by 10 inches (200 by 250 mm)**, for each species and cut. Include at least one face-veneer seam and finish as specified.
- D. Samples for Verification: For the following:
 1. Plastic-laminate-clad panel products, **8 by 10 inches (200 by 250 mm)**, for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.
 2. Thermoset polyester-overlay surfaced panel products, **8 by 10 inches (200 by 250 mm)**, for each type, color, pattern, and surface finish.
 3. Lumber with or for transparent finish, **5 inches (125 mm)** wide by **24 inches (600 mm)** long, for each species and cut, finished on 1 side and 1 edge.
 4. Exposed cabinet hardware and accessories, one unit for each type and finish.
 5. Adjustable shelving standards.
5. INFORMATIONAL SUBMITTALS
 - A. Product Certificates: Signed by manufacturers of woodwork certifying that products furnished comply with requirements.
 - 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. Woodwork Quality Standard Compliance Certificates: **SHOWING COMPLIANCE WITH AWI Quality Certification Program**
6. QUALITY ASSURANCE
 - A. Installer Qualifications: An experienced installer who has completed architectural woodwork 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. Fabricator Qualifications: A firm experienced in producing architectural woodwork similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
 - C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production and installation of interior architectural woodwork
 - D. Quality Standard: Unless otherwise indicated, comply with the 2009 AWI / AWMAC / WI "Architectural Woodwork Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
 1. Provide AWI certification labels or compliance certificate indicating that woodwork complies with requirements of grades specified.
 - E. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by

authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.

- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

7. DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

8. PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on Shop Drawings.
 - 2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

9. COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.
- B. Hardware Coordination: Distribute copies of approved hardware schedule to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

1. WOODWORK FABRICATORS

- A. Fabricators: Subject to compliance with requirements, provide interior architectural woodwork by one of the following:

Artistic Mill
Granite Mill and Fixture Company.
Huetter Mill and Cabinet Company.
MapleLeaf Cabinets

Swainston Mill, Preston ID.

2. MATERIALS

- A. General: Provide materials that comply with requirements of 2009 AWS quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Products: Comply with the following:
 - 1. Hardboard: AHA A135.4.
 - 2. Medium-Density Fiberboard: ANSI A208.2, Grade MD-Exterior Glue.
 - 3. Softwood Plywood: DOC PS 1, Medium Density Overlay.
- C. Cores: Sides, tops, bottoms, shelves, doors, drawer fronts; plywood cores only with surface of thermally fused, polyester decorative surfacing – Velvet finish where semi-exposed, plastic laminate where exposed, unless noted. Particle board cores are not acceptable.

Multi-Core Panel Products:
Roseburg products
Simpson "Plyron".
States Industries "Armorcore".
True North "Multi-Core".
- D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:
 - a. Formica Corporation.
 - b. Laminart.
 - c. Pionite
 - d. Wilsonart International; Div. of Premark International, Inc.
 - e. Nevamar

3. FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where indicated, use materials impregnated with fire-retardant chemical formulations indicated by a pressure process or other means acceptable to authorities having jurisdiction to produce products with fire-test-response characteristics specified.
 - 1. Do not use treated material that does not comply with requirements of referenced wood-working standard or that is warped, discolored, or otherwise defective.
 - 2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Comply with AWPA C20 (lumber) and AWPA C27 (plywood), for woodwork items indicated as fire-retardant treated. Use the following treatment type:
 - 1. Exterior Type: Organic-resin-based formulation thermally set in wood by kiln-drying.

2. Mill lumber after treatment, within limits set for wood removal that does not affect listed fire-test-response characteristics, using a woodworking plant certified by testing and inspecting agency.
3. Kiln-dry material before and after treatment to levels required for untreated material.

4. CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Door Hardware".
- B. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard.

5. INSTALLATION MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

6. 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.

7. FABRICATION, GENERAL

- A. Interior Woodwork Grade: Provide Premium grade interior woodwork complying with the referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Fabricate finish carpentry to dimensions, profiles, and details indicated.
 1. Back out or kerf backs of trim members, except members with ends exposed in finished work.
 2. Ease edges of lumber less than 1 inch (25 mm) in nominal thickness to 1/16-inch (1.5-mm) radius.
 3. Ease edges of lumber 1 inch (25 mm) or more in nominal thickness to 1/8-inch (3-mm) radius.

- D. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- E. Complete fabrication, including assembly, application of high pressure laminate finish, and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
 - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
- F. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 1. Seal edges of openings in countertops with a coat of varnish.

8. PLASTIC-LAMINATE CABINETS

- A. Quality Standard: Comply with Section 10, 2009 AWS STANDARDS requirements for laminate cabinets.
- B. Grade: Premium.
- C. Type of Cabinet Construction: Flush overlay.
- D. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
 - 1. Horizontal Surfaces Other Than Tops: HGS.
 - 2. Postformed Surfaces: HGP.
 - 3. Vertical Surfaces: HGS.
 - 4. Edges: VGS matching laminate in color, pattern, and finish.
- E. Component Construction:
 - 1. Toe Kicks: Fixed cabinet bases shall be constructed of $\frac{3}{4}$ " exterior grade oriented strand board with 2 x 4 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 other.
 - 2. Case Body:
 - a. Ends: Case ends shall be $\frac{3}{4}$ " thermo-fused polyester overlay laminated on high quality exterior grade plywood bonded with exterior grade adhesives and hardboard faces. Exposed edges shall be edge with 3mm PVC edge-banding. Holes shall be drilled for adjust shelf supports at 32mm (1-1/4") center.
 - b. Cabinet Top and Bottom
Base and tall cabinet top and bottom shall be:

- 1) $\frac{3}{4}$ " thick with polyester overlay laminated. High quality exterior grade plywood bonded with exterior grade adhesive and hardboard faces. The finish surface is of high quality thermo-fused polyester overlay.
 - 2) Wall cabinet top and bottom shall be 1" thick for cabinets 36-1/2" wide fused polyester overlay lamination high quality exterior grade plywood bonded with exterior grade adhesives and hardboard faces.
- c. All exposed edges shall be banded with 3mm PVC edge.
- d. Adjustable Shelves:
1. Adjustable shelves shall be 1" thermo-fused polyester overlay laminated on high quality exterior grade plywood bonded with exterior grade adhesives and hardboard faces both sides, for shelves up to 36" in width, and 1 1/4" thick for shelves over 36" in width.
 2. All exposed edges shall be banded with 3mm PVC.
 - a. All shelves to be adjustable on 1-1/4" centers.
 - b. No particle board product accepted.
 - c. Veneer core plywood as specified in Cores paragraph "Simpson Plyron" or approved equal by Owner.
3. Cabinet Back:
- a. Cabinet backs shall be $\frac{1}{4}$ " thick pre-finished hardboard for use in cabinets with or without doors and shall be recessed into ends and side.
 - b. Exposed back shall be $\frac{3}{4}$ " thermo-fused polyester overlay laminated on high quality exterior grade plywood bonded with exterior grade adhesives and hardboard faces.
4. Doors and Drawer Fronts:
- a. Plastic laminate doors and drawer fronts shall be $\frac{3}{4}$ " thick for all hinged and sliding doors with vertical grade high pressure plastic laminate exterior face and color cabinet liner on interior face. Core material is to be 11/16" high quality exterior grade plywood bonded with exterior grade adhesives and hardboard faces.
5. Drawers:
- a. Drawer box side, backs, and sub-fronts shall be 5/8" thermo-fused polyester overlay laminated on high quality exterior grade plywood bonded with exterior grade adhesives and hardboard faces and exposed top edges shall be banded with .020 thick PVC.
 - b. Drawer bottom shall be $\frac{1}{4}$ " thick pre-finished hardboard recessed into the sides, back and front.
 - c. Paper storage drawers shall be fitted with a hood at back for paper retainage, and shall have a $\frac{1}{2}$ " thick reinforced bottom.
 - d. Drawer fronts shall be mounted with an adjusting mechanism to allow full adjustability and alignment in field.
- F. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
- G. Match Architect's samples selected from full range of Manufacturers products. Selections may be considered above standard grade for manufacturers with multi-tiered pricing.

2.12 SOLID SURFACING FABRICATION

- A. Quality Standard: Comply with AWI Section 11 of 2009 AWI STANDARDS requirements for high-pressure decorative laminate countertops.

1. Premium Grade

- B. Products: Subject to compliance with requirements, including color and pattern, products are limited to the following:
Avonite
Brionne
CaesarStone Quartz
DuPont zodiac
Staron
- C. General: Fabricate interior quartz or resin filled material solid surfacing in sizes and shapes required to comply with requirements indicated, including details on Drawings and Shop Drawings. Include windowsill profiles where shown.
- D. Cut and drill sinkages and holes for anchors, fasteners, supports, and lifting devices as indicated or needed to set stone securely in place; shape beds to fit supports.
- E. Cut product to produce pieces of thickness, size, and shape indicated and to comply with fabrication and construction tolerances recommended by stone source, for faces, edges, beds, and backs.
- a. Thickness of solid surfacing Countertops: Provide thickness indicated, but not less than the following:
- 1) Nominal Thickness: 1/2 inch. Unless otherwise noted
1. Dress joints (bed and vertical) straight and at right angle to face, unless otherwise indicated.
- E. Contiguous Work: Provide chases, reveals, reglets, openings, and similar features as required to accommodate contiguous work.
- F. Finish exposed faces and edges of product to comply with requirements indicated for finish under each type of stone required and to match approved samples and mockups.
- G. Carefully inspect finished units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.
1. Fittings: Drill countertops in field for fittings, bracing, and similar items.

2.14 EPOXY RESIN PANEL ACCENTS

A. Epoxy Resin Panel Arches:

1. Basis of Design Product: The design is based upon 3Form products as scheduled, manufactured by 3form, Inc. Products from other manufacturers, subject to compliance with requirements, including translucent appearance and color.
2. Sheet minimum performance attributes:
1. Rate of Burning (ASTM D 635). Material must attain CC1 Rating

2. Self-Ignition Temperature (ASTM D 1929). Material must have a Self-ignition temperature greater than 980°F.
3. Density of Smoke (ASTM D 2843). Material must have a smoke density less than 12%.
4. Flame spread and Smoke developed testing (ASTM E 84). Material must be able to meet a level of Class A (Flame spread less than 25 and smoke less than 450)
5. Room Corner Burn Test (NFPA 286). Material must meet Class A criteria as described by the 2003 *International Building Code*.
3. Fabricate panels to designs, sizes and thicknesses indicated and to comply with indicated standards. Sizes, profiles and other characteristics are indicated on the drawings.
4. Comply with manufacturer's written recommendations for fabrication.
5. Machining: Acceptable means of machining are listed below. Ensure that material is not chipped or warped by machining operations.
 1. Sawing: Select equipment and blades suitable for type of cut required.
 2. Drilling: Drills specifically designed for use with plastic products.
 3. Routing
 4. Tapping
6. Aluminum Mounting Hardware: **ASTM B 221** (**ASTM B 221M**), with strength and durability characteristics of not less than alloy 6063-T5.
 - a. Aluminum Finish: Manufacturer's standard finish, Satin Natural.
7. Mounting Hardware Basis-of-Design: Carvart Sliding Tech V-300 Series. Provide basis-of-design or a comparable product by another manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

1. Condition woodwork to average prevailing humidity conditions in installation areas before installation.
2. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Quality Standard: Install woodwork to comply with 2009 AWS for the same grade specified in Part 2 of this Section for type of woodwork involved.
- B. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of **1/8 inch in 96 inches** (**3 mm in 2400 mm**).
- C. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces and repair damaged finish at cuts.

D Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with recommendations of chemical treatment manufacturer, including those for adhesives used to install woodwork.

E Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

F Trim Installation: 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 (610 mm)** 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

G. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

4. Install cabinets with no more than **1/8 inch in 96-inch (3 mm in 2400-mm)** sag, bow, or other variation from a straight line.
5. Fasten wall cabinets through back, near top and bottom, at ends and not more than **16 inches (400 mm)** o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish, toggle bolts through backing or framing behind wall finish.

H. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Install countertops with no more than **1/8 inch in 96-inch (3 mm in 2400-mm)** sag, bow, or other variation from a straight line.
2. Secure backsplashes to tops with concealed metal brackets at **16 inches (400 mm)** o.c. and to walls with adhesive.
3. Calk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semiexposed surfaces.

3.4 HARDWARE AND ACCESSORY SCHEDULE

- A. The following items are identified by manufacturer in order to establish quality standards and functional intent. Other manufacturers are acceptable provided their products are comparable (as judged by the Architect) to those specified.

<u>ITEM</u>	<u>PRODUCT IDENTIFICATION</u>	<u>LOCATION</u>
Hinges	Blum 170 w/ mounting plate.	Swing doors.
Drawer slide	Blum 230E, 100-lb.	Drawers.
Drawer hanging file system	Hafele Hanging File System	File drawers.
Adjust. shelf support brackets	KV-346	Shelves in casework.
Pulls	3-1/2-inch center to center wire pulls; EPCO, Futaba, or Rockford Process Control (RPC).	Drawers and swing doors.
Wire grommets	Doug Mocket 2-1/2 inch diameter, Clr anodized finish	Countertops and work surfaces where indicated.
Lock	National M4-7054C disc tumbler Lock (district standard).	<u>All swing doors and drawers</u> All cabinet locks keyed to one master, each room keyed separately.

END OF SECTION 064023

SECTION 064219 - PLASTIC-LAMINATE-FACED WOOD PANELING

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. Plastic-laminate-faced paneling (decorative laminate surfacing) as shown on drawings.
 - 2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced wood paneling unless concealed within other construction before paneling installation.
 - 3. Metal reveal trim for panel edges and intersections
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing paneling and that are concealed within other construction before paneling installation.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **Project site**.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product, **including panel products high-pressure decorative laminate adhesives and fire-retardant-treated materials**.
 - 1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Shop Drawings: Show location of paneling, large-scale details, attachment devices, and other components. Include dimensioned plans and elevations.
 - 1. Show details full size.
 - 2. Show locations and sizes of furring and blocking, including concealed blocking specified in other Sections.
- C. Samples for initial selection for high-pressure decorative laminates.
- D. Samples for verification for plastic laminates, **12 by 12 inches (300 by 300 mm)**, for each type, color, pattern, and surface finish, **with one sample applied to core material and specified edge material applied to one edge**.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For **Installer** and **Fabricator**.
- B. Product Certificates: For each type of product.
- C. Evaluation Reports: For **fire-retardant-treated materials and fire-retardant-treated paneling**, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. **Shop is a certified participant in AWI's Quality Certification Program.**
- B. Installer Qualifications: **Fabricator of products or Certified participant in AWI's Quality Certification Program.**
- C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.
- D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups of **typical paneling as shown on Drawings**.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver paneling until painting and similar operations that could damage paneling have been completed in installation areas. If paneling must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install paneling until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature between **60 and 90 deg F (16 and 32 deg C)** and relative humidity between **25 and 55** percent during the remainder of the construction period.
- B. Field Measurements: Where paneling is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support paneling by field measurements before being enclosed and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where paneling is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.9 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that paneling can be installed as indicated.

PART 2 - PRODUCTS

2.1 PANELING FABRICATORS

- A. Fabricators: Subject to compliance with requirements,
 1. Fabricators as listed in Interior architectural woodwork section
- B. Reveal Trim manufacturers

Fry Reglet

Stylmark

Monarch Metals

2.2 PANELING, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of plastic-laminate-faced wood paneling (decorative laminate surfacing) indicated for construction, finishes, installation, and other requirements.
 1. Provide **labels** from **AWI** certification program indicating that paneling, **including installation**, complies with requirements of grades specified.
 2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

2.3 PLASTIC-LAMINATE-FACED WOOD PANELING

- A. Grade: **Premium**.
- B. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3 and the following requirements:
 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. Formica Corporation.
 - b. Nevamar
 - c. Panolam Industries International Incorporated.
 - d. Pionite
 - e. Wilsonart International.
2. Faces: **Grade HGS.**
3. Backs: **Grade BKV.**
4. Exposed Edges: Same as faces.
- C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed surfaces complying with Finish Schedule
- D. Panel Core: **particleboard or medium-density fiberboard.**
 1. Thickness: **3/4 inch (19 mm).**
- E. Exposed Panel Edges: **Plastic-laminate**
- F. Adhesives for Bonding Plastic Laminate: **Unpigmented contact cement**
 1. Adhesive for Bonding Edges: Hot-melt adhesive **or adhesive specified above for faces.**
- G. Assemble panels by gluing and concealed fastening unless otherwise shown.
- H. Panel to Panel Trim: Extruded aluminum reveal with extended legs to conceal panel edges . J mold profile for end panel edges.

2.4 MATERIALS

- 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. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.5 INSTALLATION MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: **Fire-retardant-treated softwood lumber**, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls.
- C. VOC Limits for Installation Adhesives: Use products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 1. Wood Glues: 30 g/L.
 2. Multipurpose Construction Adhesives: 70 g/L.
 3. Contact Adhesive: 80 g/L.

4. Special-Purpose Contact Adhesive (contact adhesive that is used to bond melamine-covered board, metal, unsupported vinyl, rubber, or wood veneer **1/16 inch (1.6 mm)** or less in thickness to any surface): 250 g/L.

2.6 FABRICATION

- A. Complete fabrication, including assembly, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 1. Notify Architect seven days in advance of the dates and times paneling fabrication will be complete.
- B. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition paneling to average prevailing humidity conditions in installation areas.
- B. Before installing paneling, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Grade: Install paneling to comply with same grade as paneling to be installed.
- B. Install paneling level, plumb, true, and straight with no distortions. Shim as required with concealed shims. Install level and plumb to a tolerance of **1/8 inch in 96 inches (3 mm in 2400 mm)**. Install with no more than **1/16 inch in 96-inch (1.6 mm in 2400-mm)** vertical cup or bow and **1/8 inch in 96-inch (3 mm in 2400-mm)** horizontal variation from a true plane.
 1. For flush paneling with revealed joints, install with variations in reveal width, alignment of top and bottom edges, and flushness between adjacent panels not exceeding **1/32 inch (0.8 mm)**.
- C. Anchor paneling to supporting substrate with concealed **hanger clips or strips**. Do not use face fastening unless **covered by trim** or **otherwise indicated**.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective paneling, where possible, to eliminate defects; where not possible to repair, replace paneling. Adjust for uniform appearance.

- B. Clean paneling on exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064219

SECTION 075423 - THERMOPLASTIC MEMBRANE ROOFING

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. Flashing new penetrations into existing roof assembly in accordance with existing warranty in-place.
- B. Related Sections include the following:
 - 1. Division 6 Section "**Miscellaneous Carpentry**" for wood nailers, curbs, and blocking.
 - 2. Division 7 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, and counterflashings.
 - 3. Division 7 Section "Joint Sealants."
 - 4. Division 22-23 Sections for penetrations.

1.3 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Original installer or installer approved by manufacturer of existing roof system shall perform the work of this Contract to keep warranty in force, and to keep existing system watertight.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For roofing flashing. Include sections, details, and attachments to other Work.
 - 1. Base flashings and membrane terminations.
- C. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.

- D. Maintenance Data: For roofing system to include in maintenance manuals.
- E. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.
- B. Source Limitations: Obtain components for membrane roofing system **from, or approved by** roofing membrane manufacturer.
- C. Preliminary Roofing Conference: Before starting roof construction, conduct conference at Project site. Comply with requirements for preinstallation conferences in Division 1 Section "Project Management and Coordination." Review methods and procedures related to roof deck construction and roofing system including, but not limited to, the following:
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 - 5. Review base flashings, special roofing details, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
 - 6. Review governing regulations and requirements for insurance and certificates if applicable.
 - 7. Review temporary protection requirements for roofing system during and after installation.
 - 8. Review roof observation and repair procedures after roofing installation.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and 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 roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

1.8 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- 1. Available Manufacturers: Subject to compliance with requirements, the manufacturer offering products that may be incorporated into the Work is limited to, the manufacturer of the existing system in place on the existing structure with warranty in effect.

2.2 AUXILIARY MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.
 - 1. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.
- B. Bonding Adhesive: Manufacturer's standard bonding adhesive for membrane, and solvent-based bonding adhesive for base flashings.
- C. Slip Sheet: Manufacturer's recommended slip sheet, of type recommended and only if required for application.
- D. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, approximately **1 by 1/8 inch (25 by 3 mm)** thick; with anchors.
- E. Metal Battens: Manufacturer's standard aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately **1 inch (25 mm)** wide by **0.05 inch (1.3 mm)** thick, prepunched.
- F. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.
- G. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, cover strips, and other accessories.

2.3 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway **pads**, approximately **3/16 inch (5 mm)** thick, and acceptable to membrane roofing system manufacturer. location of walkway pads to route to new mechanical equipment

2.7 FLASHING

- A. Counter flashing: Galvanized Steel: ASTM A 526-85, sheet steel with 1.25 oz./sq. galvanized coating and coil coated color finish

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
 - 1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
 - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - 3. Verify that surface plane flatness and fastening of steel roof deck comply with requirements in Division 5 Section "Steel Deck."
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Place protections in place to encircle all new penetrations and protect existing membrane from accidental leaks, burns from new work over existing system.
- C. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- D. Complete base flashings and provide seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 MECHANICALLY FASTENED ROOFING MEMBRANE INSTALLATION

- A. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
 - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roofing membrane that does not meet requirements.

- B. Install roofing membrane and auxiliary materials to tie in to existing roofing.

3.4 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
- B. Apply solvent-based bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with sheet flashing.
- D. Clean seam areas and overlap and firmly roll sheet flashings into the adhesive. Weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings **and mechanically anchor to substrate through termination bars** into flashings required by other Division 7 Sections.

3.5 WALKWAY INSTALLATION

- A. Roof-Paver Walkways: Install heavyweight walkway roof pavers according to manufacturer's written instructions in locations indicated, to form walkways.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform roof tests and inspections and to prepare test reports.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.
 - 1. Notify Architect or Owner 48 hours in advance of date and time of inspection.
- C. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not 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 PROTECTING AND CLEANING

- A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075423

SECTION 078413 - 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 assemblies, including both empty openings and openings containing penetrating items:
 - 1. Walls and partitions.
 - 2. Smoke barriers.
- B. The Contractor is responsible for providing code compliant firestop systems complying with Local codes for all penetrations as well as acceptable aesthetic requirements of the Project as established by the Architect where systems are exposed to view.
- C. Related Sections include the following:
 - 1. Division 22-23 Sections specifying duct and piping penetrations.
 - 2. Division 26 Sections specifying cable and conduit penetrations.

1.3 PERFORMANCE REQUIREMENTS

- A. General: For the following constructions, 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 assembly penetrated.
 - 1. Fire-resistance-rated load-bearing walls, including partitions, with fire-protection-rated openings.
 - 2. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.
- B. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
- C. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, as determined per ASTM E 814, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
 - 1. Penetrations located outside wall cavities.
 - 2. Penetrations located in construction containing fire-protection-rated openings.

3. Penetrating items larger than 4-inch- (100-mm-) diameter nominal pipe or 16 sq. in. (100 sq. cm) in overall cross-sectional area.
- D. 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 penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- E. For through-penetration firestop systems exposed to view, provide products with flame-spread ratings of less than 25 and smoke-developed ratings of less than 450, as determined per ASTM E 84.
- F. Notwithstanding information noted later in this section, provide materials complying with LEED Credit EQ 4.1

1.4 SUBMITTALS

- A. Product Data: For each type of through-penetration firestop system product indicated.
- B. Shop Drawings: For each through-penetration firestop system, show each kind of construction condition penetrated, relationships to adjoining construction, and kind of penetrating item. Include firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction 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.
 2. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer.
- C. 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.
- D. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.
- E. Schedule of Products: Detailed listing of each product and system required for use, based upon project conditions, prepared by Manufacturer and Installer for each condition shown. Indicate code compliance for each product shown.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is qualified by having the necessary experience, staff, and training to install manufacturer's products per specified requirements. A

manufacturer's willingness to sell its through-penetration firestop system products to Contractor or to an installer engaged by Contractor does not in itself confer qualification on buyer.

- B. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in "Performance Requirements" Article:
 - 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is **UL, ITS**, 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 ASTM E 814. 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 "Fire Resistance Directory."
 - 2) ITS in "Directory of Listed Products."
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

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 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 Owner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

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, but are not limited to, the following:
 - 1. Hilti Construction Chemicals, Inc.
 - 2. International Protective Coatings Corp.
 - 3. Isolatek International.
 - 4. Nelson Firestop Products.
 - 5. Specified Technologies Inc.
 - 6. 3M Fire Protection Products.
 - 7. Tremco.
 - 8. United States Gypsum Company.

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 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by the qualified testing and inspecting agency for firestop systems indicated. 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.
 - 2. Temporary forming materials.
 - 3. Substrate primers.
 - 4. Collars.

2.3 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.
- B. 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 written recommendations of firestop system manufacturer and 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 "Performance Requirements" Article and 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, 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 FIELD QUALITY CONTROL

- A. Inspecting Agency: Contractor will engage a qualified independent inspecting agency to inspect through-penetration firestop systems and to prepare test reports.
 1. Inspecting agency will state in each report whether inspected through-penetration firestop systems comply with or deviate from requirements.
- B. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued.
- C. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

3.5 IDENTIFICATION

- A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
 1. The words: "Warning--Through-Penetration Firestop System--Do Not Disturb. Notify Owner 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.
- B. In areas exposed to view, label locations shall be determined with care to minimize exposure.

3.6 CLEANING AND PROTECTION

- 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 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 through-penetration firestop systems complying with specified requirements.

THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE FIRESTOP SYSTEMS ARE LISTED USING THE ALPHA-ALPHA-NUMERIC IDENTIFICATION SYSTEM PUBLISHED IN UL'S FIRE RESISTANCE DIRECTORY, VOL. 2						
TYPE OF PENETRANT	CONSTRUCTION					
	FLOOR PENETRATION SYSTEMS (FIRST ALPHA COMPONENT = C OR F)			WALL PENETRATION SYSTEMS (FIRST ALPHA COMPONENT = C OR W)		
	CONCRETE FLOORS WITH A MINIMUM THICKNESS LESS THAN OR EQUAL TO 5 INCHES	CONCRETE FLOORS WITH A MINIMUM THICKNESS GREATER THAN 5 INCHES	FRAMED FLOORS	CONCRETE OR MASONRY WALLS WITH A MINIMUM THICKNESS LESS THAN OR EQUAL TO 8 INCHES	CONCRETE OR MASONRY WALLS WITH A MINIMUM THICKNESS GREATER THAN 8 INCHES	FRAMED WALLS
NO PENETRATING ITEMS	C-AJ-0001-0999 or F-A-0001-0999	C-BJ-0001-0999		C-AJ-0001-0999, C-BJ-0001-0999, or W-J-0001-0999		W-L-000-1-0999
METALLIC PIPE, CONDUIT, OR TUBING	C-AJ-1001-1999 or F-A-1001-1999	C-BJ-1001-1999, C-BK-1001-1999, or F-B-1001-1999	F-C-1001-1999	C-AJ-1001-1999, C-BJ-1001-1999, or W-J-1001-1999	C-BK-1001-1999 or W-K-1001-1999	W-L-1001-1999
NONMETALLIC PIPE, CONDUIT, OR TUBING	C-AJ-2001-2999 or F-A-2001-2999	C-BJ-2001-2999 or F-B-2001-2999	F-C-2001-2999	C-AJ-2001-2999, C-BJ-2001-2999, or W-J-2001-2999		W-L-2001-2999
ELECTRICAL CABLES	C-AJ-3001-3999 or F-A-3001-3999	C-BJ-3001-3999 or F-B-3001-3999	F-C-3001-3999	C-AJ-3001-3999, C-BJ-3001-3999, or W-J-3001-3999		W-L-3001-3999
CABLE TRAYS WITH ELECTRICAL CABLES	C-AJ-4001-4999 or F-A-4001-4999	C-BJ-4001-4999		C-AJ-4001-4999, C-BJ-4001-4999, or W-J-4001-4999	W-K-4001-4999	W-L-4001-4999
INSULATED PIPES	C-AJ-5001-5999 or F-A-5001-5999	C-BJ-5001-5999	F-C-5001-5999	C-AJ-5001-5999 or W-J-5001-5999		W-L-5001-5999
MISCELLANEOUS ELECTRICAL PENETRANTS	C-AJ-6001-6999 or F-A-6001-6999			C-AJ-6001-6999		W-L-6001-6999
MISCELLANEOUS MECHANICAL PENETRANTS	C-AJ-7001-7999		F-C-7001-7999	C-AJ-7001-7999 or W-J-7001-7999		W-L-7001-7999
GROUPINGS OF PENETRATIONS	C-AJ-8001-8999 or F-A-8001-8999	C-BJ-8001-8999	F-C-8001-8999	C-AJ-8001-8999, C-BJ-8001-8999, or W-J-8001-8999		W-L-8001-8999
For each location where a fire-resistance-rated floor or wall assembly is penetrated, provide a UL-listed through-penetration firestop system selected from the applicable UL number range listed above that complies with Section 078413 - Penetration Firestopping and is suitable for the penetration conditions indicated for the Project.						

END OF SECTION 078413

SECTION 079200 - 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:
- B. This Section includes sealants for the following applications:
 - 1. Exterior joints in the following vertical surfaces and nontraffic horizontal surfaces:
 - a. Control and expansion joints in unit masonry.
 - b. Joints between different exterior materials.
 - c. Perimeter joints between exterior materials and frames of doors and windows.
 - d. All joints created by new construction
 - 2. Exterior joints in the following horizontal traffic surfaces:
 - a. joints between paving and walks.
 - 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. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
 - e. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - f. All joints created by new construction
- C. Related Sections include the following:
 - 1. Division 7 Section "Firestopping" for fire-resistant building joint-sealant systems.
 - 2. Division 8 Section "Glazing" for glazing sealants.
 - 3. Division 9 Section "Gypsum Board Assemblies" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.

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.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial 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. Samples for Verification: For each type and color of joint sealant required. Install joint sealants in ~~1/2-inch-~~ (13-mm-) wide joints formed between two ~~6-inch-~~ (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.
- E. SWRI Validation Certificate: For each elastomeric sealant specified to be validated by SWRI's Sealant Validation Program.
- 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.
- G. Compatibility and Adhesion Test Reports: From sealant manufacturer indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- H. Product Test Reports: From a qualified testing agency indicating sealants comply with requirements, based on comprehensive testing of current product formulations.
- I. Warranties: Special warranties specified in this Section.

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. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.
 - 1. 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 joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in peel, and indentation hardness.

3. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.

- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

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 or are below 40 deg F (4.4 deg C).
 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. 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. Special Installer's Warranty: Written warranty, signed by Installer agreeing 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: Two years from date of Substantial Completion.
- C. Special Manufacturer's Warranty: Written warranty, signed by elastomeric sealant manufacturer agreeing to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: 20 years from date of Substantial Completion.
- D. 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 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 specified in the sealant schedules at the end of Part 3.

2.2 MATERIALS, GENERAL

- A. 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.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range for this characteristic.

2.3 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. Stain-Test-Response Characteristics: Where elastomeric sealants are specified in the Elastomeric Joint-Sealant Schedule to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

2.4 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.

2.5 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.

2.6 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.

2.7 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:
 - 1. Type C: Closed-cell material with a surface skin.
 - 2. Type O: Open-cell material.
 - 3. Type B: Bicellular material with a surface skin.
 - 4. Type: Any material indicated above.
- C. 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.

2.8 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. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. 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 the following:
 - a. Concrete.
 - b. Masonry.
 - c. 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.
 - a. Metal.
 - b. Glass.
 - c. 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.
- 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.
 - 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. Low-Modulus Nonacid-Curing Silicone Sealant: Where joint sealants of this type are indicated, provide products complying with the following:

1. Products: **Available products include the following**

- a. 790; Dow Corning.
- b. UltraPruf SCS2300; GE Silicones.
- c. HiFlex 331; NUCO Industries, Inc.
- d. 890; Pecora Corporation.
- e. 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 Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

7. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.

8. Applications: Building standard unless otherwise noted.

- B. Mildew-Resistant Silicone Sealant : Where joint sealants of this type are indicated, provide products formulated with fungicide that are intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes, and that comply with the following:

1. Products:

- a. 786 Mildew Resistant; Dow Corning.
- b. Sanitary 1700; GE Silicones.
- c. Tremsil 600 White; 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: G, A, and, as applicable to joint substrates indicated, O.

- a. Use O Joint Substrates: **ceramic tile.**

6. Applications: Interior toilets at fixtures and expansion joints. VCT joints at interior partitions.

- C. Pourable Silicone Sealant: Where joint sealants of this type are indicated, provide products complying with the following:

1. Products:
 - a. 890-SL; Dow Corning.
 - b. FC Parking Structure Sealant; Dow Corning.
2. Type and Grade: **S (single component)** and P (pourable).
3. Class: 25.
4. Additional Movement Capability: 100 percent movement in extension and **50** percent in compression for a total of **150** percent movement
5. Uses Related to Joint Substrates: M and, as applicable to joint substrates indicated, O.
6. Applications: Concrete sidewalks, curbs and paving

3.7 SOLVENT-RELEASE JOINT-SEALANT SCHEDULE

- A. Butyl-Rubber-Based Solvent-Release Sealant : Where joint sealants of this type are indicated, provide products complying with the following:

1. Products: **Available products include the following**
 - a. Bostik 300; Bostik Inc.
 - b. PTI 707; H.B. Fuller Company.
 - c. BC-158; Pecora Corporation.
 - d. PSI-301: Polymeric Systems, Inc. Sonneborn Multi-Purpose Sealant; Sonneborn Building Products Div., ChemRex, Inc.
 - e. Tremco Butyl Sealant; Tremco.
2. Applications: Bedding thresholds, concealed joints in flashing systems

3.8 LATEX JOINT-SEALANT SCHEDULE

- A. Latex Sealant : Where joint sealants of this type are indicated, provide products complying with the following:

1. Products
 - a. Chem-Calk 600; Bostik Inc.
 - b. NuFlex 330; NUCO Industries, Inc.
 - c. LC 160 All Purpose Acrylic Caulk; Ohio Sealants, Inc.
 - d. AC-20; Pecora Corporation.
 - e. PSI-701; Polymeric Systems, Inc.
 - f. Sonolac; Sonneborn Building Products Div., ChemRex, Inc.
 - g. Tremflex 834; Tremco.
2. Applications: Interior joints in gypsum board applications

END OF SECTION 079200

SECTION 081213 - STEEL DOOR 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. This Section includes steel door frames where shown.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 8 Section for solid core wood doors
 - 2. Division 9 Section for build-in of door frames.
 - 2. Division 8 Section "Door Hardware" for door hardware.
 - 3. Division 9 Section "Painting" for field painting primed door frames.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of frame and panel specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.
- C. Shop Drawings showing fabrication and installation of steel door frames. Include details of each frame type, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.
- D. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Contract Drawings.

1.4 QUALITY ASSURANCE

- A. Provide frames complying with ANSI/SDI 100 "Recommended Specifications for Standard Steel Doors and Frames" and as specified.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver door frames cardboard-wrapped or crated to provide protection during transit and job storage.
- B. Inspect frames on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect; otherwise, remove and replace damaged items as directed.

- C. Store door frames at building site under cover. Place units on minimum 4-inch- (100-mm-) high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If cardboard wrappers become wet, remove cartons immediately. Provide minimum 1/4-inch (6-mm) spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Steel Doors and Frames:
 - a. Amweld, Inc.
 - b. Ceco Door Products.
 - c. Curries Co.
 - d. Fenestra Corp.
 - e. Kewanee Corp.
 - f. Steelcraft.

2.2 MATERIALS

- A. Hot-Rolled Steel Sheets and Strip: Commercial-quality carbon steel, pickled and oiled, complying with ASTM A 569 (ASTM A 569M).
- B. Cold-Rolled Steel Sheets: Carbon steel complying with ASTM A 366 (ASTM A 366M), commercial quality, or ASTM A 620 (ASTM A 620M), drawing quality, special killed. Provide galvanized sheet for exterior panels
- C. Supports and Anchors: Fabricated from not less than 0.0478-inch- (1.2-mm-) thick steel sheet; 0.0516-inch- (1.3-mm-) thick galvanized steel where used with galvanized steel frames.
- D. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize complying with ASTM A 153, Class C or D as applicable.

2.4 FRAMES

- A. Provide metal frames for doors, borrowed lights, and other openings, according to ANSI/SDI 100, and of types and styles as shown on Drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricate frames of minimum 16-gage cold-rolled steel sheet for interiors.
 - 1. Fabricate frames with mitered or coped and continuously welded corners.
- B. Door Silencers: drill stops to receive 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.
- C. Plaster Guards: Provide minimum 0.0179-inch- (0.45-mm-) thick steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

2.5 FABRICATION

- A. Fabricate steel frame units to be rigid, neat in appearance, and free from defects, warp, or buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site. Comply with ANSI/SDI 100 requirements.
- B. Fabricate exposed faces of panels, from only cold-rolled steel sheet.
- C. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.
- E. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.
- F. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of SDI 107 and ANSI A115 Series specifications for door and frame preparation for hardware.
- G. Locate hardware as indicated on Shop Drawings or, if not indicated, according to the Door and Hardware Institute's (DHI) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

2.6 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
- B. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for steel sheet finishes.
- C. Apply primers to door frames after fabrication.
- D. Factory Priming for Field-Painted Finish: Apply shop primer that complies with ANSI A224.1 acceptance criteria, is compatible with finish paint systems indicated, and has capability to provide a sound foundation for field-applied topcoats. Apply primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install steel frameS, and accessories according to Shop Drawings, manufacturer's data, and as specified.
- B. Placing Frames: Comply with provisions of SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
 - 1. In metal-stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In steel-stud partitions, attach wall anchors to studs with screws.
 - 2. Install fire-rated frames according to NFPA 80.

3. Fill frames with mortar for openings in masonry walls as indicated by drawings.

3.2 ADJUSTING AND CLEANING

- A. Prime Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

END OF SECTION 081113

SECTION 081416 - 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 installed in existing frames and in new frames where shown.
 - 2. Factory finishing flush wood doors.
 - 3. Factory fitting flush wood doors to frames and factory machining for hardware.
- B. Related Sections include the following:
 - 1. Division 8 Section "Steel Doors and Frames" for frames
 - 2. Division 8 Section "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, trim for openings, and louvers.
 - 1. 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. Indicate dimensions and locations of mortises and holes for hardware.
 - 2. Indicate dimensions and locations of cutouts.
 - 3. Indicate requirements for veneer matching.
 - 4. Indicate doors to be factory finished and finish requirements.
 - 5. Indicate fire ratings for fire doors.
- C. Samples for Initial Selection: Color charts consisting of actual materials in small sections for the following:
 - 1. Faces of factory-finished doors with transparent finish. Show the full range of colors available for stained finishes.
 - 2. Verify stain required to match existing to remain
- D. Samples for Verification: As follows:
 - 1. Corner sections of doors approximately 8 by 10 inches (200 by 250 mm) with door faces and edgings representing the typical range of color and grain for each species of veneer and solid lumber required. Finish sample with same materials proposed for factory-finished doors.
 - 2. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.
- B. Quality Standard: Comply with the following standard:
 - 1. WDMA Quality Standard: WDMA I.S.1-A, "Architectural Wood Flush Doors."
- 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. Oversized, Fire-Rated Wood Doors: For door assemblies exceeding sizes of tested assemblies, provide manufacturer's certificate stating that doors comply with all standard construction requirements of tested and labeled fire-door assemblies except for size.
 - 3. Temperature-Rise Rating: At stairwell enclosures, provide doors that have a temperature-rise rating of **250 deg F (139 deg C)** maximum in 30 minutes of fire exposure.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced standard and manufacturer's written instructions.
 - 1. Individually package doors in cardboard cartons and wrap bundles of doors in plastic sheeting.
- B. Mark each door with individual opening numbers used on Shop Drawings. Use removable tags or concealed markings.

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. General Warranty: Door manufacturer's 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. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form, signed by manufacturer, Installer, and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup, or twist) more than **1/4 inch (6.35 mm)** in a **42-by-84-inch (1067-by-2134-mm)** section or that show telegraphing of core construction in face veneers exceeding **0.01 inch in a 3-inch (0.25 mm in a 75-mm)** span, or do not comply with tolerances in referenced quality standard.
 - 1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 2. Warranty shall be in effect during the following period of time after the 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, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Flush Wood Doors:
 - a. Algoma Hardwoods Inc.
 - b. Eggers Industries; Architectural Door Division.
 - c. Graham Manufacturing Corp.
 - d. Ideal Wood Products, Inc.
 - e. Marshfield Industries

2.2 DOOR CONSTRUCTION, GENERAL

- A. Doors for Transparent Finish: Comply with the following requirements:
1. Grade: Premium (Grade AA faces)
 2. Faces: **TO MATCH EXISTING – FIELD VERIFY**
 3. Match between Veneer Leaves: Book match.
 4. Match within Door Faces: Balance match.
 5. Pair and Set Match: Provide for pairs of doors and for doors hung in adjacent sets.
- B. WDMA I.S.1-A Performance Grade:
1. Heavy Duty unless otherwise indicated.
 2. Extra Heavy Duty: **Classrooms public toilets janitor's closets assembly spaces exits .**

2.3 SOLID-CORE DOORS

- A. Particleboard Cores: Comply with the following requirements:
1. Particleboard: ANSI A208.1, Grade LD-2.
 2. Blocking: Provide wood blocking at particleboard-core doors as follows:
 - a. **5-inch (125-mm)** top-rail blocking, at doors indicated to have closers.
 - b. **5-inch (125-mm)** bottom-rail blocking, at exterior doors and doors indicated to have kick, mop, or armor plates.
 - c. **5-inch (125-mm)** mid-rail blocking, at doors indicated to have exit devices.
- B. Interior Veneer-Faced Doors: Comply with the following requirements:
1. Core: Particleboard core.
 2. Construction: Five plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.
- C. Fire-Rated Doors: Comply with the following requirements:
1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as required to provide fire rating indicated.
 2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated and as follows:
 - a. **5-inch (125-mm)** top-rail blocking.

- b. 5-inch (125-mm) bottom-rail blocking, at doors indicated to have kick, mop, or armor plates.
 - c. 4-1/2-by-10-inch (114-by-250-mm) lock blocks.
 - d. 5-inch (125-mm) midrail blocking, at doors indicated to have exit devices.
 - e. As necessary to eliminate need for through-bolting hardware.
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 that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals.

2.4 LIGHT FRAMES

- A. Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.0478-inch- (1.2-mm-) thick, cold-rolled steel sheet, factory primed and approved for use in doors where fire rating is indicated.

2.5 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:
- 1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements of NFPA 80 for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
- 1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
 - 2. Metal Astragals: Premachine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- C. 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 as standard with manufacturer.

2.6 FACTORY FINISHING

- A. General: Comply with referenced quality standard's requirements for factory finishing.
- B. Finish wood doors at factory.
- C. Transparent Finish: Comply with requirements indicated for grade, finish system, staining effect, and sheen.
- 1. Grade: Premium.
 - 2. Finish: Manufacturer's standard finish with performance requirements comparable to AWI System TR-6 catalyzed polyurethane.
 - 3. Staining: Match Architect's sample - MATCH EXISTING THAT REMAINS
 - 4. Effect: Filled finish.
 - 5. Sheen: Semigloss

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine 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 plumb jambs and level heads.
 - 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 wood doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.
 - 1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory-Finished Doors: Restore finish before installation, if fitting or machining is required at Project site.

3.3 ADJUSTING AND PROTECTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Refinish or replace doors damaged during installation.
- C. Protect doors as recommended by door manufacturer to ensure that wood doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 084113 - 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 entrance doors.
 - 2. Frames for entrances.
 - 3. Storefront-type framing system for entrances
 - 4. Hardware matching the Building Standard for all storefront doors.
- B. Related Sections: The following sections contain requirements that relate to this Section:
 - 1. Division 7 Section for transitions to air barrier at all openings.
 - 2. Division 8 Section "Glass and Glazing" for glazing installed in aluminum entrances and storefronts, including entrances specified to be factory glazed.
 - 3. Division 8 Section "Finish Hardware" for requirements of hardware sets and lock cylinders.

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 deg F (100 deg C) 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 1/270 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 50 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 1/4 inch. The clearance between the member and an operable door or window shall be at least 1/16 inch.
 3. All system components to support glazing and doors without sag or bow .
- 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.
- H. Energy Performance: Glazed storefront shall have certified and labeled energy performance ratings in accordance with NFRC.
1. Thermal Conductance: Provide aluminum-framed systems with U-factors in accordance with NFRC 100 by an accredited independent laboratory, and labeled and certified by the manufacturer/installer. Provide aluminum-framed systems with fixed glazing and framing areas having an average U-factor of not more than **0.45 Btu/sq. ft. x h x deg F** when tested according to NFRC 100.
 2. Solar Heat Gain Coefficient: Provide aluminum-framed systems with solar heat gain coefficient in accordance with NFRC 200 by an accredited independent laboratory, and labeled and certified by the manufacturer/installer. Provide aluminum-framed systems with fixed glazing and framing areas having a solar heat gain coefficient of no greater than 0.40 as determined according to NFRC 200.

1.4 SUBMITTALS

- A. General: Contractor to maintain each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
1. Product data for each aluminum entrance and storefront system required, including:
 - a. Manufacturer's standard details and fabrication methods.
 - b. Data on finishing, hardware and accessories.
 - c. Recommendations for maintenance and cleaning of exterior surfaces.
 2. Shop drawings for each aluminum entrance and storefront system required, including:
 - a. Layout and installation details, including relationship to adjacent work.
 - b. Elevations at 1/4-inch scale.

- c. Detail sections of typical composite members.
 - d. Anchors and reinforcement.
 - e. Hardware mounting heights.
 - f. Provisions for expansion and contraction.
 - g. Glazing details.
3. Show design strength and span capabilities of headers and framing for openings.
4. Hardware Schedule: Submit complete hardware schedule organized into sets based on hardware specified. Coordinate hardware with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish. Include item name, name of the manufacturer and complete designations of every item required for each door opening.
 - a. Where intent is shown in schematic schedules as specified herein, provide Complete operating system for doors indicated.
5. 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. Single Source Responsibility: Obtain aluminum entrance and storefront systems from one source and from a single manufacturer.
- C. Design Criteria: The drawings indicate the size, profile, and dimensional requirements of aluminum entrance and storefront work required. Aluminum storefront by specified 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.

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. Warranty: Submit a written warranty, executed by the manufacturer, agreeing to repair or replace units that fail in materials or workmanship within the specified warranty period. Failures include, but are not necessarily limited to:
 1. Structural failures including excessive deflection, excessive leakage or air infiltration.
 2. Faulty operation.
 3. Deterioration of metals, metal finishes and other materials beyond normal weathering.
- B. Warranty Period: 3 years after the date of Substantial Completion.
- C. The warranty shall not deprive the Owner of other rights or remedies the Owner may have under other provisions of the Contract Documents, and is in addition to and runs concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide storefront systems manufactured by one of the following:
 1. Amarlite Architectural Products.
 2. Kawneer Company, Inc.
 3. Tubelite
 4. United States Aluminum ,CR Laurence
 5. Vistawall Architectural Products.

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 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.
 - 5. 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.
 - 6. 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. Miscellaneous Trim: Provide interior sills, exterior sills, closures, flashings, trim and other elements in conjunction with or adjacent to storefront system. Fabricate from 0.060-inch-thick minimum aluminum finished to match other components, except fabricate interior and exterior sills from 0.125-inch-thick minimum aluminum.
- G. 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.
- H. Concrete and Masonry Inserts: Provide cast iron, malleable iron, or hot-dip galvanized steel inserts complying with ASTM A 123.
- I. 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.
- J. Sliding Weatherstripping: Manufacturer's standard replaceable weatherstripping of wool, polypropylene, or nylon woven pile, with nylon fabric or aluminum strip backing, complying with AAMA 701.2.
- K. Sealants and Joint Fillers: Provide silicone sealant and accessory materials complying with Division 7 Section Joint Sealers.
- L. Glazing Gaskets: Elastomeric extrusions standard with, or recommended by the storefront manufacturer.

2.3 HARDWARE

- A. Hardware shall be provided by Section 087100 Door Hardware supplier according to the requirements of that section.
- B. Install heavy-duty hardware units as indicated, scheduled, or required for operation of each door, including the following items of sizes, number, and type recommended by manufacturer for service required; finish to match door.
- C. Card Readers if indicated, shall be provided by division 28 section and installed according to requirements of Division 8 Section for Door Hardware.

2.4 COMPONENTS

- A. Storefront Framing System: Provide storefront and entrance framing systems fabricated from extruded aluminum members of size and profile indicated. Provide for flush glazing storefront from the exterior on all sides without projecting stops.
- 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, closers and operators.
- C. Stile-and-Rail Type Entrance Doors: Provide tubular frame members of thick-wall extrusions.
 - 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 1-7/8-inch-thick doors fabricated from nominal .188 thick extrusions of Wide stile (5 inch min. dimension) and rail design as indicated on Drawings."
 - 3. Head rails of doors to be full flush free of recesses or slots that could retain water

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.
 - 1. Thermal-Break Construction: Fabricate 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.
 - 3. Make provisions for electronic security system as indicated on electrical drawings.
- C. Reinforcing: Install reinforcing as required for hardware and as necessary for performance requirements, sag resistance and rigidity.
- D. 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.
- E. Continuity: Maintain accurate relation of planes and angles with hairline fit of contacting members.
- F. Fasteners: Conceal fasteners wherever possible.
- G. Weatherstripping: For exterior doors, provide compression weatherstripping against fixed stops. At other edges, provide sliding weatherstripping retained in adjustable strip mortised into door edge.

1. Provide EPDM or vinyl-blade gasket weatherstripping in bottom door rail, adjustable for contact with threshold.

2.6 FINISHES

- A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
- B. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.
- C. Class I, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.010 mm 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. 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.

- 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, base flashings, sill extenders and other members in bed of sealant , or with joint fillers to provide weathertight construction. Comply with requirements of Division 7 for sealants, fillers, and gaskets. Provide positive slope for drainage of all base materials to maintain weathertight performance.
 - 1. Provide silicone sealant and joint fillers at juncture of storefront framing with other materials. Comply with requirements of Division 7 for sealants, fillers, and gaskets. Seal to aluminum frame, not to snap-on extension cover.
- G. Refer to "Glass and Glazing" Section of Division 8 for installation of glass indicated to be glazed into doors and framing.

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.

END OF SECTION

SECTION 084513 – STRUCTURED POLYCARBONATE PANEL 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 Cellular **Polycarbonate insulating panels** at walkway canopies.
- B. Related Sections include the following:
 - 1. Division 5 Section "Structural Steel" for walkway canopy framing.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Loads: Provide unit skylights, including glazing and anchorage, capable of withstanding the effects of the following design loads:
 - 1. Snow Load: 100 psf plus drift per IBC 2012
 - 2. Negative Pressure (Uplift) Load: 20 psf

1.4 SUBMITTALS

- A. General: **Contractor to maintain each item in this Article** according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data: For unit skylights. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work
- D. Samples for Initial Selection: For cellular skylight units.

1.5 QUALITY ASSURANCE

- A. Fire-Test Response Characteristics of Plastic Glazing: Provide plastic glazing sheets identical to those tested for fire-exposure behavior per test method indicated below by a testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Self-Ignition Temperature: **650 deg F (343 deg C)** or greater for plastic sheets in thickness indicated when tested per ASTM D 1929.
 - 2. Smoke Production Characteristics: Comply with either requirement below:

- a. Smoke-Developed Index: 450 or less when tested per ASTM E 84 on plastic sheets in manner indicated for use.
 - b. Smoke Density: 75 or less when tested per ASTM D 2843 on plastic sheets in thickness indicated for use.
3. Relative-Burning Characteristics: Tested per ASTM D 635.
- a. Polycarbonate Glazing: Class CC1, burning extent of **1 inch (25 mm)** or less for nominal thickness of **0.060 inch (1.5 mm)** or thickness indicated for use.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of unit skylights that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
1. Uncontrolled water leakage.
 2. Yellowing of glazing materials
 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 4. Breakage of polycarbonate glazing.
- B. Warranty Period: **Five** years from Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Aladdin Skylights
 2. American Skylites Inc.;
 3. Bristolite Skylights;
 4. CPI International; .
 5. Naturalite Skylight Systems; .
 6. Wasco Products, Inc.;

2.2 UNIT SKYLIGHTS

- A. Polycarbonate-Insulating-Panel Glazing – Walkway canopies: CPI - Pentaglas 12 system or equal. Manufacturer's standard polycarbonate sheet with cellular cross section and 5/8 inch tall ribs for flashing panel to panel, formed to provide isolated airspaces and that is coextruded with a UV-protective layer.
1. Color: Ice White
- B. Glazing Gaskets: **Manufacturer's standard**
- C. Aluminum Components:
1. Sheets: **ASTM B 209 (ASTM B 209M)**, alloy and temper to suit forming operations and finish requirements but with not less than the strength and durability of alclad alloy 3005-H25.

2. Extruded Shapes: **ASTM B 221 (ASTM B 221M)**, alloy and temper to suit structural and finish requirements but with not less than the strength and durability of alloy 6063-T52.
 3. Anodic Coating: Class I, **clear anodic coating** complying with AAMA 611.
- D. Fasteners: Same metal as metal being fastened, nonmagnetic stainless steel, or other noncorrosive metal as recommended by manufacturer. Finish exposed fasteners to match material being fastened.
1. Where removal of exterior exposed fasteners might allow access to building, provide nonremovable fastener heads.

2.3 INSTALLATION MATERIALS

- A. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic, nominally free of sulfur and containing no asbestos fibers, formulated for **15-mil (0.4-mm)** dry film thickness per coating.
- B. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.
- C. Elastomeric Sealant: ASTM C 920; Type S; Grade NS; Class 25; and Uses NT, G, A, and (as applicable to joint substrates indicated) O; recommended by unit skylight manufacturer and compatible with joint surfaces.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Coordinate skylight installation with installation of substrates, roof insulation, roofing, and flashing as required to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight.
1. Unless otherwise indicated, install unit skylights according to construction details of NRCA's "The NRCA Roofing and Waterproofing Manual."
- B. Where metal surfaces of units will contact incompatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation recommended in writing by unit skylight manufacturer.
- C. Anchor unit skylights securely to supporting substrates.
- D. Set Panel skylights as follows:
1. Fit frame joints to produce hairline joints free of burrs and distortion.
 2. Rigidly secure nonmovement joints.
 3. Accommodate thermal and mechanical movements.
 4. Install framing components to drain water passing joints and to drain condensation and moisture occurring or migrating within skylight system to the exterior.
- E. Where cap flashing is indicated or required, install to produce waterproof overlap with roofing or roof flashing. Seal with thick bead of mastic sealant except where overlap is indicated to be left open for ventilation.

3.2 CLEANING

- A. Clean exposed surfaces according to manufacturer's written instructions. Touch up damaged metal coatings.

END OF SECTION

SECTION 087100 - DOOR HARDWARE

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. Commercial door hardware for the following:
 - a. Swinging doors.
 - b. Other doors to the extent indicated.
- 2. Cylinders for doors specified in other Sections.
- 3. Electrified door hardware.

- B. Related Sections include the following:

- 1. Division 08 Section "Hollow Metal Doors and Frames"
- 2. Division 08 Section "Aluminum-Framed Entrances and Storefronts"
- 3. Division 08 Section "Flush Wood Doors"
- 4. Division 26 Sections for connections to electrical power system and for low-voltage wiring work.
- 5. Division 28 Section "Access Control" for access control devices installed at door openings and provided as part of a security access system.
- 6. Division 28 Section "Intrusion Detection" for detection devices installed at door openings and provided as part of an intrusion detection system.
- 7. Division 28 Section "Fire Detection and Alarm" for connections to building fire alarm system.

- C. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.

- 1. Thresholds, weather stripping, and cylinders for locks specified in other Sections.

1.3 SUBMITTALS

- A. Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Details of electrified door hardware, indicating the following:

1. Wiring Diagrams: Power, signal, and control wiring. Include the following:
 - a. System schematic.
 - b. Point-to-point wiring diagram.
 - c. Riser diagram.
 - d. Elevation of each door.
 2. Detail interface between electrified door hardware and fire alarm, access control, security, building control system.
 3. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.
- C. Samples for Verification: For exposed door hardware of each type, in specified finish, full size. Tag with full description for coordination with the door hardware sets. Submit Samples before, or concurrent with, submission of the final door hardware sets, if requested.
1. Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.
- D. Qualification Data: For Installer.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for locks, latches, and closers as requested.
- F. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.
- G. Warranty: Special warranty specified in this Section.
- H. Door Hardware Sets: Prepared by or under the supervision of Architectural Hardware Consultant, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final door hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
1. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
 2. Content: Include the following information:
 - a. Identification number, location, hand, fire rating, and material of each door and frame.
 - b. Type, style, function, size, quantity, and finish of each door hardware item.
 - c. Complete designations of every item required for each door or opening including name and manufacturer.
 - d. Fastenings and other pertinent information.
 - e. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - f. Explanation of abbreviations, symbols, and codes contained in schedule.
 - g. Mounting locations for door hardware.
 - h. Door and frame sizes and materials.

- i. Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
 - 1) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.
 - j. List of related door devices specified in other Sections for each door and frame.
3. Submittal Sequence: Submit the final door hardware sets at earliest possible date, particularly where approval of the door hardware sets must precede fabrication of other work that is critical in Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the door hardware sets.
- I. Keying Schedule: Prepared by or under the supervision of Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by lock manufacturer.
- 1. Installer's responsibilities include supplying and installing door hardware and providing a qualified Architectural Hardware Consultant available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
 - 2. Installer shall have warehousing facilities in Project's vicinity.
 - 3. Scheduling Responsibility: Preparation of door hardware and keying schedules.
 - 4. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and 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.
- C. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
- 1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
- D. Electrified Door Hardware: 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. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." In addition to Owner, Construction Manager, Contractor, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant and Owner's Security Consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
 - 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. Address for delivery of keys.
- F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification related to the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys to Owner's Representative by registered mail or overnight package service.

1.6 COORDINATION

- A. Coordinate layout and installation of recessed hardware with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. 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. Coordinate with aluminum entrance door supplier for door hardware installation.
- D. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, access control system, security system, and building control system.
- E. Existing Openings: Where new hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide for proper operation.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of operators and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - 2. Warranty Period: Three (3) years from date of Substantial Completion, except as follows:
 - a. Exit Devices: Two (2) years from date of Substantial Completion.
 - b. Manual Closers: Thirty (30) years from date of Substantial Completion.

1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Maintenance Service: Beginning at Substantial Completion, provide six (6) months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation. Provide parts and supplies same as those used in the manufacture and installation of original products.

1.9 EXTRA MATERIALS

- A. Furnish full-size units of door hardware 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. Door Hardware:
 - a. 1 ea. VD 98L X 626.
 - b. 1 ea. MKS 195S X 626.
 - c. 1ea. LCN 4040XP HEDA 689.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Products:
 - a. Finish: Shall be US26D, unless otherwise noted.
 - b. Manufacture Standard:
 - 1) Butts: Ives*
 - 2) Locksets: Marks* (Owner's Standard)
 - 3) Closers: LCN* (Owner's Standard)
 - 4) Auto Operators: LCN* (Owner's Standard)
 - 5) Exit Devices: Von Duprin* (Owner's Standard)
 - 6) Trim: Ives*
 - 7) Continuous Hinges: Ives*
 - 8) Rem Mullion: Von Duprin* (Owner's Standard)
 - B. Substitution requests for non-Owner Standard hardware items will be made in accordance with Division 01 requirements.

2.2 SCHEDULED HARDWARE

- A. Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of finish hardware are indicated in the "Hardware Schedule" at the end of this Section. Products are identified by using hardware designation numbers of the following:
1. Manufacturer's Product Designations: The product designation and name of one manufacturer are listed for each hardware type required for the purpose of establishing minimum requirements. Provide either the product designated or, where more than one manufacturer is specified under the Article "Manufacturers" in Part 2 for each hardware type, the comparable product of one of the other manufacturers that complies with requirements.
 2. ANSI/BHMA designations used elsewhere in this Section or in schedules to describe hardware items or to define quality or function are derived from the following standards. Provide products complying with these standards and requirements specified elsewhere in this Section.
 - a. Butts and Hinges: ANSI A156.1.
 - b. Bored and Preassembled Locks and Latches: ANSI/BHMA A156.2.
 - c. Exit Devices: ANSI A156.3.
 - d. Door Controls - Closers: ANSI A156.4.
 - e. Auxiliary Locks and Associated Products: ANSI/BHMA A156.5.
 - f. Architectural Door Trim: ANSI A156.6.
 - g. Template Hinge Dimensions: ANSI A156.7.

- h. Door Controls - Overhead Holders: ANSI A156.8.
- i. Mortise Locks and Latches: ANSI A156.13.
- j. Closer Holder Release Devices: ANSI A156.15.
- k. Auxiliary Hardware: ANSI A156.16.
- l. Self-Closing Hinges and Pivots: ANSI A156.17.
- m. Materials and Finishes: ANSI A156.18.

2.3 MATERIALS AND FABRICATION

- A. Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI/BHMA A156 series standards for each type of hardware item and with ANSI/BHMA A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.
- B. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.
- C. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
- D. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Where thru-bolts are used as a means of reinforcing the work, provide sleeves for each thru-bolt or use sex screw fasteners.

2.4 HINGES, GENERAL

- A. Quantity: Provide the following, unless otherwise indicated:
 - 1. Two Hinges: For doors with heights up to 60 inches.
 - 2. Three Hinges: For doors with heights 61 to 90 inches.
- B. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- C. Hinge Weight: As indicated in hardware sets.
- D. Hinge Base Metal: Unless otherwise indicated, provide the following:
 - 1. Exterior Hinges: Stainless steel with stainless-steel pin.
 - 2. Interior Hinges: Steel with steel pin.
 - 3. Hinges for Fire-Rated Assemblies: Steel with steel pin.

- E. Hinge Options: Where indicated in door hardware sets or on Drawings:
 - 1. Safety Stud: Designed for stud in one leaf to engage hole in opposing leaf.
 - 2. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for outswinging doors.
 - 3. Corners: Square.
- F. Fasteners: Comply with the following:
 - 1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
 - 2. Wood Screws: For wood doors and frames.
 - 3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.

2.5 CONTINUOUS HINGES

- A. Hinges shall be a geared continuous hinge utilizing a single gear section for the door leaf and a separate gear section for the frame side of the door. The door leaf and jamb leaf shall fully mortised where scheduled, and full surface where scheduled.. Geared hinges are to be certified to ANSI 156.25, Grade 2 and UL 10C tested and approved for 90 minutes.

2.6 LOCKS, LATCHES, AND BOLTS

- A. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set, unless otherwise indicated.
- B. Lock Throw: Provide 5/8-inch (16-mm) minimum throw of latch on pairs of doors. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.
- C. Flush Bolt Heads: Minimum of 1/2-inch- (13-mm-) diameter rods of brass, bronze, or stainless steel with minimum 12-inch- (300-mm-) long rod for doors up to 84 inches (2100 mm) in height. Provide longer rods as necessary for doors exceeding 84 inches (2100 mm) in height.
- D. Cylindrical Locks - ANSI A156.2 Series 4000, Grade 1 Strength and Operational requirements. Meets A117.1 Accessibility Codes. Latch bolts shall be steel with minimum 9/16" throw, deadlocking on keyed and exterior functions. 3/4" throw anti-friction latchbolt on pairs of fire doors. Through bolted roses with spring loaded thru-bolts. Levers: Solid cast Zamac with 1/2" return. Provide 5 year warranty.

2.7 KEYING REQUIREMENTS

- A. General: Supplier will meet with Owner to finalize keying requirements and obtain final instructions in writing.
- B. Review the keying system with the Owner and provide a master, grandmaster or great-grandmaster integrated with Owner's existing system. If key pinning charts are required, owner to furnish charts to hardware supplier.
- C. Furnish temporary keyed cores for the construction period, and remove these when directed. The construction cores remain property of the supplier and shall be returned to the supplier when they

are removed. Contractor shall install the permanent cores in the presence of the owner's representative.

D. Permanent Keys: Secured shipment direct from point of origination to Owner's Representative

1. For estimate: 2 keys per change combination, 5 master keys per group, 5 grand-master keys, 3 control keys.

2.8 PUSH/PULL UNITS

A. Exposed Fasteners: Provide manufacturer's standard exposed fasteners for installation, thru-bolted.

2.9 CLOSERS

A. Accessibility Requirements: Where handles, pulls, latches, locks and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural Transportations Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

1. Comply with the following maximum opening-force requirements:

- a. Interior, Non-fire-rated Hinged Doors: 5 lbf applied perpendicular to door.
- b. Fire Doors: Minimum opening force allowable by Authorities Having Jurisdiction (AHJ).

B. Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 30 lbf to set door in motion and not more than 15lbf to open door to minimum required width.

C. Cylinder: Shall be of high strength cast iron construction. All door exterior closers shall be tested to ANSI/BHMA A156.4 test requirements by a BHMA certified independent testing laboratory. A written certification showing successful completion of a minimum of 10,000,000 cycles for all exterior door closers must be provided. Cylinder shall have been manufactured and in the marketplace for a minimum of 10 years

D. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory sized closers, adjustable to meet field conditions and requirements for opening force.

E. Surface Closers: BHMA A156.4 Grade 1. Provide type of arm required for closer to be located on non-public side of door, unless otherwise indicated.

1. Full rack-and-pinion type cylinder with removable non-ferrous cover and cast iron body. Double heat-treated pinion shaft, single piece forged piston, chrome silicon steel spring.
2. XL cylinder body to have 1½" piston diameter with ¾" journal double heat treated shaft, (.1421" teeth thickness,) 5/8" full complement bearings, chrome silicon steel spring.
3. Cylinder body to have "FAST" power adjust speed dial to show spring size power.
4. Closers to have forged steel main arm and forearm for REG, EDA and CUSH type arms

5. ISO 2000 certified. Units stamped with date-of-manufacture code.
6. Independent lab-tested 10,000,000 cycles.
7. Thru-bolts at wood doors unless doors are provided with closer blocking. Non-sized, non-handed, and adjustable. Place closer inside building, stairs, and rooms.
8. Plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.
9. Opening pressure: Exterior doors 8.5 lb., interior doors 5 lb., labeled fire doors 15 lb.
10. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.
11. Extra-duty arms (EDA) at exterior doors scheduled with parallel arm units.
12. Exterior doors do not require seasonal adjustments in temperatures from 120 degrees F to -30 degrees F, furnish data on request.
13. Non-flaming fluid will not fuel door or floor covering fires.
14. Pressure relief valves are not allowed.

2.10 DOOR OPERATORS / ADA SPECIAL CLOSERS

- A. Where low kinetic energy, as defined by ANSI Standard A156.19, Surface Door Operators shall be electrically powered closers complying with the 1990 ADA requirements for opening force and time to close standards. Full closing force controlled by the hydraulic sweep and latch valves shall be provided when the power or assist cycle ends.
- B. Door Operators shall be rack and pinion action with one-piece forged steel pistons. Pinion shaft diameter shall be a minimum of 1 1/16".
- C. Separate adjusting valves shall be provided for closing speed, latching speed and back-check.
- D. Adjusting valves shall be made of a metal material, regulating the fluid through a "V-SLOT" valve, concealed, adjustable only with special wrench, and shall be seated with "O" type rings.
- E. Door Operators and supporting equipment shall carry a manufacturers two (2) year warranty.
- F. Door Operator shall have built in the following features:
 1. Opening Speed adjustment.
 2. Opening Force adjustment (15 lb. Maximum).
 3. Time Delay.
 4. On-board Diagnostics.
 5. On-board power supply.
 6. Factory default memory.
 7. On/off switch.
 8. Hold open switch.
 9. On-board capabilities to be either wired for simultaneous or sequential operation at vestibules.
 10. Out-put triggers for electric strikes or electric latch retraction.

2.11 EXIT DEVICES/PANIC HARDWARE

- A. General features: BHMA A156.3, Grade 1.
- B. Accessibility Requirements: Where handles, pulls, latches, locks and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural Transportations Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
 - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
- C. Exit Devices for Means of Egress Doors: Comply with NFPA 101. Exit devices shall not require more than 15lbf to release the latch. Locks shall not require use of a key, tool of special knowledge for operation.
- D. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to AHJ for panic protection, based on testing according to UL 305.
 - 1. Independent lab-tested 10,000,000 cycles.
 - 2. Push-through touch pad design. No exposed touch bar fasteners, no exposed cavities when operated. Return stroke fluid dampeners and rubber bottoming dampeners, plus anti-rattle devices.
 - 3. No exposed screws to show through glass doors.
 - 4. Non-handed basic device design with center case interchangeable with all functions, no extra parts required to effect change of function.
- E. Specific features:
 - 1. Non-Fire Rated Devices: As scheduled in hardware sets.
 - 2. Lever Trim: Vandal resistant, forged brass or bronze escutcheon min .130" thickness, match lockset lever design.
 - 3. Fire-Labeled Devices: UL label indicating "Fire Exit Hardware". Vertical rod devices less bottom rod (LBR) unless otherwise scheduled.
 - 4. Electrically Operated Devices: Single manufacturer source for electric latch retraction devices, electrically controlled trim, power transfers, power supplies, monitoring switches and controls.
 - 5. Furnish all exit devices with deadlocking latchbolts.
 - 6. End caps shall be sloped and of heavy-duty metal alloy construction and provide horizontal adjustment to provide flush alignment with device cover plate. When device end cap is installed, no raised edges will protrude. End cap shall be cast metal or forged aluminum and have a minimum thickness of (.250"). Plastic or metal stamping will not be acceptable.
 - 7. Provide all shim kits and filler plates to allow flush mounting of exit devices on all types of doors used in this project.
 - 8. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key.

2.12 TRIM AND STOPS

- A. Kick plates, mop plates, and armor plates, shall be .050 gauge with 32D finish. Kick plates to be 10" high, mop plates to be 5" high. All plates shall be two (2) inches less full width of door.
- B. Push plates, pull plates, door pulls, and miscellaneous door trim shall be shown in the hardware schedule.
- C. Doorstops shall be furnished for all doors to prevent damage to doors or hardware from striking adjacent walls or fixtures. Wall stops are preferred. Floor stops are used only where noted in hardware schedule. Where conditions prohibit the use wall type stops, furnish overhead stops either surface mounted or concealed as noted in hardware sets.

2.13 WEATHERSTRIPPING AND SEALS

- A. General: Provide continuous weatherstripping on exterior doors and smoke, light, or sound seals on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.14 THRESHOLDS

- A. General: Except as otherwise indicated, provide standard metal threshold unit of type, size, and profile as shown or scheduled.

2.15 ELECTRICAL HARDWARE

- A. Furnish wiring diagrams to electrical contractor for use in installing electrical hardware products.
- B. Electrical contractor to run all wiring and make all final connections for electrified hardware. Hardware supplier shall be responsible to furnish all wiring diagrams to operate electrified hardware. Access control material and electrified hardware to interface at junction boxes.

2.16 HARDWARE FINISHES

- A. Match items to the manufacturer's standard color and texture finish for the latch and locksets (or push-pull units if no latch or lock sets).
- B. Provide finishes that match those established by BHMA or, if none established, match the Architect's sample.
- C. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.
- D. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18, "Materials and Finishes," including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: Comply with DHI A115 Series.
 - 1. Surface-Applied Door Hardware: Drill and tap doors and frames according to ANSI A250.6.
- B. Wood Doors: Comply with DHI A115-W Series.

3.3 INSTALLATION

- A. Pre-installation conference shall be conducted prior to installation of hardware at Project site. Meet with the, Owner, Contractor, installer, and manufacturers representatives. A separate pre-installation conference shall be conducted prior to the installation of electronic security hardware with the electrical contractor Review catalogs, brochures, templates, installation instructions, and the approved hardware schedule. Survey installation procedures and workmanship, with special emphasis on unusual conditions, as to ensure correct technique of installation, and coordination with other work. Notify participants at least ten, 10 working days before conference.
- B. Hardware Installers must have a minimum of five (5) years experience in installation of hardware. Provide verification of installer's qualification to Consultant for approval. All installers to attend review meetings with the hardware distributor.
- C. Install hardware using only manufacturer supplied and approved fasteners in strict adherence with manufacturers published installation instructions.
- D. Install head seal prior to installation of "PA"-parallel arm mounted door closers and push side mounted door stops/holders. Trim, cut and notch thresholds and saddles neatly to minimally fit the profile of the door frame. Install thresholds and saddles in a bed of caulking completely sealing the underside from water and air penetration.
- E. Counter sink through bolt of door pull under push plate during installation.
- F. Mounting Heights: Mount door hardware units at heights indicated, as follows, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
 3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- G. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- H. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

3.4 FIELD QUALITY CONTROL

- A. Architectural Hardware Consultant: Architect will engage a qualified Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
- B. Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 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. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
 2. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.
- B. Occupancy Adjustment: Approximately six months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust, including adjusting operating forces, each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.8 DOOR HARDWARE SETS

- A. The following schedule of hardware sets shall be considered a guide and the supplier is cautioned to refer to general conditions, special conditions, and the full requirements of this section. It shall be the hardware supplier's responsibility to furnish all required hardware.
- B. Where items of hardware are not definitely or correctly specified and are required for completion of the Work, a written statement of such omission, error, conflict, or other discrepancy shall be sent to the Architect, prior to date specified for receipt of bids, for clarification by addendum.
- C. Adjustments to the Contract Sum will not be allowed for omissions or items of hardware not clarified prior to bid opening.

HW SET NO: 01

3	EA	HINGES AS REQ'D	BY EXISTING FRAME CONDITIONS	652	IVE
1	EA	STOREROOM LOCK	195 F	626	MKS
1	EA	ELECTRIC STRIKE	ES-6400	✓ 630	SCE
1	EA	LOCK GUARD	LG14	630	IVE
(IF REQ'D)					
1	EA	SURFACE CLOSER	4040XP SCUSH MC TBWMS	689	LCN
1	EA	CUSH SHOE	4040-30	689	LCN
SUPPORT					
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	REMOTE RELEASE	BUTTON BY DIV 26	✓	B/O
1	EA	DOOR CONTACT	679-05HM	✓	BLK SCE
1		POWER SUPPLY	& RELAYS BY DIV 28	✓	B/O

ELECTRIC STRIKE KEEPER MAY BE LOCKED AND UNLOCKED THROUGH ACCESS CONTROL SYSTEM. IT MAY BE RELEASED OR LOCKED BY REMOTE PUSH BUTTON. LOCATION OF PUSH BUTTON TBD.

PATCH, REPAIR, REFINISH FRAME TO LIKE NEW CONDITION.

HW SET NO: 02

1	EA	CONT. HINGE	224HD	628	IVE
3	EA	HINGE FILLER	FF-45		DON
			(SIZE AS REQ'D)		
1	EA	HOSP PRIVACY LATCH	195 TK	626	MKS
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

PATCH, REPAIR, REFINISH FRAME TO LIKE NEW CONDITION.

HW SET NO: 03

1	EA	CONT. HINGE	224HD	628	IVE
3	EA	HINGE FILLER	FF-45		DON
			(SIZE AS REQ'D)		
1	EA	PUSH PLATE	8200 6" X 16"	630	IVE
1	EA	PULL PLATE	8305 10" 6" X 16"	630	IVE
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

PATCH, REPAIR, REFINISH FRAME TO LIKE NEW CONDITION.

HW SET NO: 04

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	HOSP PRIVACY LATCH	195 TK	626	MKS
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET NO: A

2	EA	CONT. HINGE	112HD EPT	628	IVE
2	EA	POWER TRANSFER	EPT10	✓ 689	VON
1	EA	KEYED REMOVABLE MULLION	KR4954	689	VON
1	EA	ELEC PANIC HARDWARE	LX-RX-QEL+-98-NL-OP-110MD	✓ 626	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL+-98-EO	✓ 626	VON
1	EA	RIM CYLINDER	7015RA (981 KEYWAY)	626	ILC
1	EA	MORTISE CYLINDER (MULLION)	7185RA (981 KEYWAY)	626	ILC
2	EA	LONG DOOR PULL	9264F 36" 20" STD	630	IVE
2	EA	OH STOP	100S ADJ	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	SURF. AUTO OPERATOR	4642 CS FC	✓ 689	LCN
1	EA	PA MOUNTING PLATE	4040-18PA	689	LCN
1	EA	BLADE STOP SPACER	4040-61	689	LCN
1	EA	ACTUATOR, JAMB MOUNT	8310-818 (INTERIOR PUSH SIDE MULLION)	✓ 630	LCN
1	EA	ACTUATOR, WALL MOUNT	8310-853 (EXTERIOR PULL SIDE)	✓ 630	LCN
1	EA	PERIMETER SEALS	DOOR MFG STD	AL	B/O
2	EA	DOOR SWEEP	DOOR MFG STD	AL	B/O
1	EA	THRESHOLD	DOOR MFG STD	AL	B/O
2	EA	DOOR CONTACT	7764	✓ 628	SCE
		POWER SUPPLY	& RELAYS BY DIV 28	✓	B/O

AUTO LOCK/UNLOCK THROUGH ACCESS CONTROL SYSTEM FOR PUSH/PULL OPERATION AS PROGRAMED BY ACCESS CONTROL TIME AND CALENDAR FEATURE. LOCKDOWN FROM REMOTE LOCATION TBD. EXTERIOR ACTUATOR TURNED OFF/ON THROUGH ACCESS CONTROL SYSTEM. OPERATORS FUNCTION INDEPENDENTLY. MULLION ACTUATORS ARE ALWAYS ACTIVE AND RETRACT THE EXIT DEVICE FOR EXITING. DOOR POSITION IS MONITORED THROUGH ACCESS CONTROL SYSTEM. REX IS IN EXIT DEVICE PUSH BAR.

HW SET NO: B

2	EA	CONT. HINGE	112HD EPT	628	IVE
2	EA	POWER TRANSFER	EPT10	✓ 689	VON
1	EA	KEYED REMOVABLE MULLION	KR4954	689	VON
2	EA	ELEC PANIC HARDWARE	RX-QEL+-98-EO	✓ 626	VON

1	EA	MORTISE CYLINDER	7185RA (981 KEYWAY) (MULLION)	626	ILC
2	EA	LONG DOOR PULL	9264F 36" 20" STD	630	IVE
2	EA	OH STOP	100S ADJ	630	GLY
2	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
2	EA	PA MOUNTING PLATE	4040-18PA	689	LCN
2	EA	BLADE STOP SPACER	4040-61	689	LCN
1	EA	PERIMETER SEALS	DOOR MFG STD	AL	B/O
2	EA	DOOR SWEEP	DOOR MFG STD	AL	B/O
1	EA	THRESHOLD	DOOR MFG STD	AL	B/O
2	EA	DOOR CONTACT	679-05HM	⚡ BLK	SCE
		POWER SUPPLY	& RELAYS BY DIV 28	⚡	B/O

AUTO LOCK/UNLOCK THROUGH ACCESS CONTROL SYSTEM FOR PUSH/PULL OPERATION
 AS PROGRAMED BY ACCESS CONTROL TIME AND CALENDAR FEATURE. LOCKDOWN
 FROM REMOTE LOCATION TBD.

DOOR POSITION IS MONITORED THROUGH ACCESS CONTROL SYSTEM. REX IS IN EXIT
 DEVICE PUSH BAR.

HW SET NO: C

1	EA	CONT. HINGE	112HD	628	IVE
1	EA	STOREROOM LOCK	195 F	626	MKS
1	EA	ELECTRIC STRIKE	6400 FSE	⚡ 630	VON
1	EA	LOCK GUARD	LG14 (IF REQ'D)	630	IVE
1	EA	OH STOP	100S ADJ	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	PA MOUNTING PLATE	4040-18PA	689	LCN
1	EA	BLADE STOP SPACER	4040-61	689	LCN
1	EA	PERIMETER SEALS	DOOR MFG STD	AL	B/O
2	EA	DOOR SWEEP	DOOR MFG STD	AL	B/O
1	EA	THRESHOLD	DOOR MFG STD	AL	B/O
1	EA	REMOTE RELEASE	BUTTON BY DIV 26	⚡	B/O
1	EA	DOOR CONTACT	7764	⚡ 628	SCE
		POWER SUPPLY	& RELAYS BY DIV 28	⚡	B/O

ELECTRIC STRIKE KEEPER MAY BE LOCKED AND UNLOCKED THROUGH ACCESS
 CONTROL SYSTEM. IT MAY BE RELEASED OR LOCKED BY REMOTE PUSH BUTTON.
 LOCATION OF PUSH BUTTON TBD.

END OF SECTION

⚡ = Hardware Item Requiring Electrical Coordination**HW SET NO: 01**

DOOR NUMBER: (Includes but is not limited to the following doors)

102B

3	EA	HINGES AS REQ'D	BY EXISTING FRAME CONDITIONS	652	IVE
1	EA	STOREROOM LOCK	195 F	626	MKS
1	EA	ELECTRIC STRIKE	ES-6400	⚡ 630	SCE
1	EA	LOCK GUARD	LG14	630	IVE
(IF REQ'D)					
1	EA	SURFACE CLOSER	4040XP SCUSH MC TBWMS	689	LCN
1	EA	CUSH SHOE SUPPORT	4040-30	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	REMOTE RELEASE	BUTTON BY DIV 26	⚡	B/O
1	EA	DOOR CONTACT	679-05HM	⚡ BLK	SCE
1		POWER SUPPLY	& RELAYS BY DIV 28	⚡	B/O

ELECTRIC STRIKE KEEPER MAY BE LOCKED AND UNLOCKED THROUGH ACCESS CONTROL SYSTEM. IT MAY BE RELEASED OR LOCKED BY REMOTE PUSH BUTTON. LOCATION OF PUSH BUTTON TBD.

PATCH, REPAIR, REFINISH FRAME TO LIKE NEW CONDITION.

HW SET NO: 02

DOOR NUMBER: (Includes but is not limited to the following doors)

113

1	EA	CONT. HINGE	224HD	628	IVE
3	EA	HINGE FILLER	FF-45		DON
(SIZE AS REQ'D)					
1	EA	HOSP PRIVACY LATCH	195 TK	626	MKS
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

PATCH, REPAIR, REFINISH FRAME TO LIKE NEW CONDITION.

HW SET NO: 03

DOOR NUMBER: (Includes but is not limited to the following doors)

121

1	EA	CONT. HINGE	224HD	628	IVE
3	EA	HINGE FILLER	FF-45		DON
(SIZE AS REQ'D)					
1	EA	PUSH PLATE	8200 6" X 16"	630	IVE
1	EA	PULL PLATE	8305 10" 6" X 16"	630	IVE
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

PATCH, REPAIR, REFINISH FRAME TO LIKE NEW CONDITION.

⚡ = Hardware Item Requiring Electrical Coordination**HW SET NO: 04**

DOOR NUMBER: (Includes but is not limited to the following doors)

112

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	HOSP PRIVACY LATCH	195 TK	626	MKS
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET NO: A

DOOR NUMBER: (Includes but is not limited to the following doors)

101C

101F

2	EA	CONT. HINGE	112HD EPT	628	IVE
2	EA	POWER TRANSFER	EPT10	⚡ 689	VON
1	EA	KEYED REMOVABLE MULLION	KR4954	689	VON
1	EA	ELEC PANIC HARDWARE	LX-RX-QEL+-98-NL-OP-110MD	⚡ 626	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL+-98-EO	⚡ 626	VON
1	EA	RIM CYLINDER	7015RA (981 KEYWAY)	626	ILC
1	EA	MORTISE CYLINDER	7185RA (981 KEYWAY) (MULLION)	626	ILC
2	EA	LONG DOOR PULL	9264F 36" 20" STD	630	IVE
2	EA	OH STOP	100S ADJ	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA MC	689	LCN
1	EA	SURF. AUTO OPERATOR	4642 CS FC	⚡ 689	LCN
1	EA	PA MOUNTING PLATE	4040-18PA	689	LCN
1	EA	BLADE STOP SPACER	4040-61	689	LCN
1	EA	ACTUATOR, JAMB MOUNT	8310-818 (INTERIOR PUSH SIDE MULLION)	⚡ 630	LCN
1	EA	ACTUATOR, WALL MOUNT	8310-853 (EXTERIOR PULL SIDE)	⚡ 630	LCN
1	EA	PERIMETER SEALS	DOOR MFG STD	AL	B/O
2	EA	DOOR SWEEP	DOOR MFG STD	AL	B/O
1	EA	THRESHOLD	DOOR MFG STD	AL	B/O
2	EA	DOOR CONTACT	7764	⚡ 628	SCE
		POWER SUPPLY	& RELAYS BY DIV 28	⚡	B/O

AUTO LOCK/UNLOCK THROUGH ACCESS CONTROL SYSTEM FOR PUSH/PULL OPERATION AS PROGRAMED BY ACCESS CONTROL TIME AND CALENDAR FEATURE. LOCKDOWN FROM REMOTE LOCATION TBD. EXTERIOR ACTUATOR TURNED OFF/ON THROUGH ACCESS CONTROL SYSTEM. OPERATORS FUNCTION INDEPENDENTLY. MULLION ACTUATORS ARE ALWAYS ACTIVE AND RETRACT THE EXIT DEVICE FOR EXITING.

DOOR POSITION IS MONITORED THROUGH ACCESS CONTROL SYSTEM. REX IS IN EXIT DEVICE PUSH BAR.

⚡ = Hardware Item Requiring Electrical Coordination**HW SET NO: B**

DOOR NUMBER: (Includes but is not limited to the following doors)

101A	101B	101D	101E		
2 EA	CONT. HINGE	112HD EPT		628	IVE
2 EA	POWER TRANSFER	EPT10		⚡ 689	VON
1 EA	KEYED REMOVABLE MULLION	KR4954		689	VON
2 EA	ELEC PANIC HARDWARE	RX-QEL+-98-EO		⚡ 626	VON
1 EA	MORTISE CYLINDER	7185RA (981 KEYWAY) (MULLION)		626	ILC
2 EA	LONG DOOR PULL	9264F 36" 20" STD		630	IVE
2 EA	OH STOP	100S ADJ		630	GLY
2 EA	SURFACE CLOSER	4040XP EDA MC		689	LCN
2 EA	PA MOUNTING PLATE	4040-18PA		689	LCN
2 EA	BLADE STOP SPACER	4040-61		689	LCN
1 EA	PERIMETER SEALS	DOOR MFG STD		AL	B/O
2 EA	DOOR SWEEP	DOOR MFG STD		AL	B/O
1 EA	THRESHOLD	DOOR MFG STD		AL	B/O
2 EA	DOOR CONTACT	679-05HM		⚡ BLK	SCE
	POWER SUPPLY	& RELAYS BY DIV 28		⚡	B/O

AUTO LOCK/UNLOCK THROUGH ACCESS CONTROL SYSTEM FOR PUSH/PULL OPERATION AS PROGRAMED BY ACCESS CONTROL TIME AND CALENDAR FEATURE. LOCKDOWN FROM REMOTE LOCATION TBD.

DOOR POSITION IS MONITORED THROUGH ACCESS CONTROL SYSTEM. REX IS IN EXIT DEVICE PUSH BAR.

HW SET NO: C

DOOR NUMBER: (Includes but is not limited to the following doors)

102A					
1 EA	CONT. HINGE	112HD		628	IVE
1 EA	STOREROOM LOCK	195 F		626	MKS
1 EA	ELECTRIC STRIKE	6400 FSE		⚡ 630	VON
1 EA	LOCK GUARD	LG14 (IF REQ'D)		630	IVE
1 EA	OH STOP	100S ADJ		630	GLY
1 EA	SURFACE CLOSER	4040XP EDA MC		689	LCN
1 EA	PA MOUNTING PLATE	4040-18PA		689	LCN
1 EA	BLADE STOP SPACER	4040-61		689	LCN
1 EA	PERIMETER SEALS	DOOR MFG STD		AL	B/O
2 EA	DOOR SWEEP	DOOR MFG STD		AL	B/O
1 EA	THRESHOLD	DOOR MFG STD		AL	B/O
1 EA	REMOTE RELEASE	BUTTON BY DIV 26		⚡	B/O
1 EA	DOOR CONTACT	7764		⚡ 628	SCE
	POWER SUPPLY	& RELAYS BY DIV 28		⚡	B/O

ELECTRIC STRIKE KEEPER MAY BE LOCKED AND UNLOCKED THROUGH ACCESS CONTROL SYSTEM. IT MAY BE RELEASED OR LOCKED BY REMOTE PUSH BUTTON. LOCATION OF PUSH BUTTON TBD.

⚡ = Hardware Item Requiring Electrical Coordination

SECTION 088000 - GLASS AND GLAZING

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. Extent of glass and glazing work is indicated on drawings and schedules.
- B. Types of glass and glazing work include the following:
 - 1. Storefront construction.
 - 2. Entrances and other doors.

1.3 SYSTEM DESCRIPTION:

- A. Provide glass and glazing that has been produced, fabricated and installed to withstand normal thermal movement, wind loading and impact loading (where applicable), without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glass and glazing materials and other defects in the work.
 - 1. Normal thermal movement is defined as that resulting from an ambient temperature range of 120 deg. F (67 deg. C) and from a consequent temperature range within glass and glass framing members of 180 deg. F (100 deg. C).
 - 2. Deterioration of insulating glass is defined as failure of hermetic seal due to other causes than breakage which results in intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coating, if any, resulting from seal failure, and any other visual evidence of seal failure or performance.

1.4 QUALITY ASSURANCE:

- A. Glazing Standards: Comply with recommendations of Flat Glass Marketing Association (FGMA) "Glazing Manual" and "Sealant Manual" except where more stringent requirements are indicated. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this section or other referenced standards.
- B. Safety Glazing Standard: Where safety glass is indicated or required by authorities having jurisdiction, provide type of products indicated which comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for category II materials.
 - 1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.
- C. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component pane of units with appropriate certification label of inspecting and testing organization indicated below:

1. Insulating Glass Certification Council (IGCC).

1.5 DELIVERY, STORAGE, AND HANDLING:

- A. Protect glass and glazing materials during delivery, storage and handling to comply with manufacturer's directions and as required to prevent edge damage to glass, and damage to glass and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.
 1. Where insulating glass units will be exposed to substantial altitude changes, avoid hermetic seal ruptures by complying with insulating glass fabricator's recommendations for venting and sealing.

1.6 PROJECT CONDITIONS:

- A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost, condensation or other causes.
 1. Install liquid sealants at ambient and substrate temperatures above 40 deg. F (4.4 deg. C).

1.7 WARRANTY:

- A. General: Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.
- B. Manufacturer's Special Project Warranty on Insulating Glass: Provide written warranty signed by manufacturer of insulating glass agreeing to furnish f.o.b. point of manufacture, freight allowed project site, within specified warranty period indicated below, replacements for those insulating glass units developing manufacturing defects. Manufacturing defects are defined as failure or hermetic seal of air space (beyond that due to glass breakage) as evidenced by intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coatings, if any, and other visual indications of seal failure or performance; provided the manufacturer's instructions for handling, installing, protecting and maintaining units have been complied with during the warranty period.
 1. Warranty Period: Manufacturer's standard but not less than 10 years after date of substantial completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL:

- A. Primary Glass Standard: Provide primary glass which complies with ASTM C 1036 requirements, including those indicated by reference to type, class, quality, and, if applicable, form, finish, mesh and pattern.
- B. Heat-Treated Glass Standard: Provide heat-treated glass which complies with ASTM C 1048 requirements, including those indicated by reference to kind, condition, type, quality, class, and, if applicable, form, finish, and pattern.

- C. Sizes: Fabricate glass to sizes required for glazing openings indicated, with edge clearances and tolerances complying with recommendations of glass manufacturer. Provide thicknesses indicated or, if not otherwise indicated, as recommended by glass manufacturer for application indicated.

2.2 PRIMARY GLASS PRODUCTS:

- A. Clear Float Glass: Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select).

2.3 HEAT-TREATED GLASS PRODUCTS:

- A. Manufacturing Process: Manufacture heat-treated glass as follows:
 - 1. By horizontal (roller hearth) process with roll wave distortion parallel with bottom edge of glass as installed, unless otherwise indicated.
- B. Uncoated Clear Heat-Treated Float Glass: Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), kind as indicated below.
 - 1. Kind FT (fully tempered).

2.4 COATED GLASS PRODUCTS:

- A. 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.
 - 1. Provide Kind FT (fully tempered) products where coated safety glass is indicated.
- B Coated Float Glass: Float glass with low emissivity coating deposited during manufacturing process, complying with requirements specified in schedules at the end of Part 3.

2.5 SEALED INSULATING GLASS UNITS:

- A. General: Provide preassembled units consisting of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space and complying with ASTM E 774 for performance classification indicated as well as with other requirements specified for glass characteristics, air space, sealing system, sealant, spacer material, corner design and dessicant.
 - 1. For properties of individual glass panes making up units, refer to product requirements specified elsewhere in this section applicable to types, classes, kinds and conditions of glass products indicated.
 - 2. Provide heat-treated panes of kind and at locations indicated or, if not indicated, provide heat-strengthened panes where recommended by manufacturer for application indicated and tempered where indicated or where safety glass is designated or required.
 - 3. Performance Classification per ASTM E 774: Class A.

- a. Thickness of Each Pane: 1/4".
 - b. Air Space Thickness: 1/2".
 - c. Sealing System: Dual seal; primary and secondary sealant: manufacturer's standard materials except secondary sealant to be silicone.
 - d. Spacer Material: Aluminum.
4. Dessicant: Manufacturer's standard; either molecular sieve or silica gel or blend of both.
5. Corner Construction: Manufacturer's standard corner construction.
- B. Insulating Glass Units: Manufacturer's standard units complying with the following requirements:
 1. Exterior Pane: Clear with Low E coating on 2nd Surface
 2. Interior Pane: Clear.

2.7 ELASTOMERIC GLAZING SEALANTS:

- A. General: Provide products of type indicated and complying with the following requirements:
 1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials with which they will come into contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
 2. Suitability: Comply with recommendations of sealant and glass manufacturers for selection of glazing sealants and tapes which have performance characteristics suitable for applications indicated and conditions at time of installation.
 3. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those for Type, Grade, Class and Uses.
 4. Colors: Provide color of exposed sealants indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.
- B. One-Part Non-Acid-Curing Silicone Glazing Sealant: Type S; Grade NS, Class 25; Uses NT, G, A, and, as applicable to uses indicated, O; and complying with the following requirements for modulus and additional joint movement capability.
 1. Medium Modulus: Tensile strength of not less than 45 nor more than 75 psi at 100 percent elongation when tested per ASTM D 412 after 14 days at 77 deg. F (20 deg. C) and 50 percent relative humidity.
- C. Products: Subject to compliance with requirements, provide one of the following:
 1. One-Part Non-Acid Curing Medium-Modulus Silicone Glazing Sealant:
 - a. "Dow Corning 795"; Dow Corning Corp.
 - b. "Silpruf"; General Electric Corp.
 - c. "Spectrum 2"; Tremco, Inc.

2.10 MISCELLANEOUS GLAZING MATERIALS:

- A. Compatibility: Provide materials with proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

- C. Setting Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealants, 80 to 90 Shore A durometer hardness.
- D. Spacers: Neoprene, EPDM or silicone blocks, or continuous extrusions, as required for compatibility with glazing sealant, of size, shape and hardness recommended by glass and sealant manufacturers for application indicated.
- E. Edge Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealant, of size and hardness required to limit lateral movement (side-walking) of glass.
- F. Compressible Filler Rods: Closed-cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam, flexible and resilient, with 5-10 psi compression strength for 25 percent deflection.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Require Glazier to inspect work of glass framing erector for compliance with manufacturing and installation tolerances, including those for size, squareness, offsets at corners; for presence and functioning of weep system; for existence of minimum required face or edge clearances; and for effective sealing of joinery. Obtain Glazier's written report listing conditions detrimental to performance of glazing work. Do not allow glazing work to proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

- A. Pre-Installation Meeting: At Contractor's direction, Glazier, sealant and gasket manufacturers' technical representatives, glass framing erector and other trades whose work affects glass and glazing shall meet at project site to review procedures and time schedule proposed for glazing and coordination with other work.
- B. Clean glazing channels and other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to substrates. Remove lacquer from metal surfaces where elastomeric sealants are indicated for use.

3.3 GLAZING, GENERAL:

- A. Comply with combined printed recommendations of glass manufacturers, of manufacturers of sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those of referenced glazing standards.
- B. Glazing channel dimensions as indicated in details are intended to provide for necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by job conditions at time of installation.
- C. Protect glass from edge damage during handling and installation; 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. Rotate glass with flares or bevels along one horizontal edge which would occur in vicinity of setting blocks so that these are located at top of opening. Remove from project and dispose of glass units with edge damage or other imperfections of kind that, when installed, weakens glass and impairs performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants.

3.4 GLAZING:

- A. Install setting blocks of proper size in sill rabbet, located one quarter of glass width from each corner, but with edge nearest corner not closer than 6" from corner, unless otherwise required. Set blocks in thin course of sealant which is acceptable for heel bead use.
- B. Provide spacers inside and out, of correct size and spacing to preserve required face clearances, for glass sizes larger than 50 united inches (length plus height), except where gaskets or glazing tapes with continuous spacer rods are used for glazing. Provide 1/8" minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.
- C. Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer.
- D. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.
- E. Provide compressible filler rods or equivalent back-up material, as recommended by sealant and glass manufacturers, to prevent sealant from extruding into glass channel weep systems and from adhering to joints back surface as well as to control depth of sealant for optimum performance, unless otherwise indicated.
- F. Force sealants into glazing channels to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.
- G. Tool exposed surfaces of sealants to provide a substantial "wash" away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, so as to eliminate dirt and moisture pockets.
- H. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when installation is subjected to movement.
- I. Miter cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent pull away at corners; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.5 PROTECTION AND CLEANING:

- A. Protect exterior glass from breakage immediately upon installation by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If substances do come into contact with glass, remove immediately by method recommended by glass manufacturer.
- C. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.
- D. Wash glass on both faces not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Wash glass by method recommended by glass manufacturer.

3.6 INSULATING GLASS SCHEDULE

- A. Coated Clear Float Glass: Where glass as designated below is indicated, provide Type 1 (clear, flat), Class 1 (clear) glass lites complying with the following:

Manufacturers who may provide products , subject to compliance with requirements, include, but are not limited to the following:

Guardian

PPG

Viracon

1. Coated Clear Float Glass: Kind FT (fully tempered) at areas subject to impact
Low E on 2rd Surface

Insulating Glass Type 1 – Clear PPG Solarban 60 Low E coated or equal

1. Visible Light Transmittance: 70%
2. Winter Nighttime U-Value: .29
3. Summer Daytime U-Value: .28
4. Shading Coefficient: 0.44
5. Outdoor Visible Reflectance: 11%
6. LSG: 1.84
7. Coating Location: **Second surface**
8. Coated Clear Fully Tempered Float Glass : Condition C (other coated glass), Kind FT (fully tempered) at areas in line of egress and /or subject to impact.

END OF SECTION

FINISH LEGEND

CODE	MANUFACTURER	PRODUCT		SIZE
		PRODUCT NAME/NUMBER	FINISH	
FLOORS				
F1	MANNINGTON COMMERCIAL	WALK-OFF CARPET - STATE CONTRACT NO. STYLE: RUFFIAN II	COLOR: EBONY EARTH 1506	24"x24"
F2	AMERIPOLISH OR EQUAL	POLISHED CONCRETE STYLE NAME/NUMBER: SURELOCK POLISHED CONCRETE COLOR SYSTEM	COLOR NAME/NUMBER: F2a: SAND F2b: GOLD F2c: MAROON F2d: PINE GREEN	N/A
F3	MANNINGTON COMMERCIAL OR EQUAL	CARPET TILE - STATE CONTRACT CONSTRUCTION: GRAPHIC LOOP A: ELEMENTAL NEUTRALS II B: ELEMENTAL BRIGHTS II	COLOR NAME/NUMBER: F3a: ALUMINUM 14129 F3b: LITHIUM 14099	24"x24"
F4	DALTILE OR EQUAL	MOSAIC PORCELAIN FLOOR TILE STYLE: KEYSTONE COLORBODY PORCELAIN	COLOR NAME/NUMBER: BLEND COLOR: DK11	2" X 2" HEXAGON
BASE				
B1	ROPPE OR EQUAL	COVE RUBBER BASE STYLE: PINNACLE STANDARD	COLORS TO BE SELECTED FROM MANUFACTURERS FULL LINE OF COLORS	4" COVE
B2	DALTILE OR EQUAL	COLOUR SCHEME	COLOR: EMERALD	6" X 12" COVE
WALLS				
W1		PLASTIC LAMINATE WALL SYSTEM STYLE AND REVEAL SIZED TBD	COLOR NAMES / NUMBERS: A: NEVAMAR: SANTA ROSA PLUM WZ2001T B: NEVAMAR: LEGENDARY TEAK WTOOO4T	N/A
W2	DALTILE OR EQUAL	PORCELAIN WALL TILE STYLE: IMAGICA COLOR BODY PORCELAIN	COLOR NAME/NUMBER: VISION - LIGHT POLISHED	12" X 24"
W3	DALTILE OR EQUAL	COLOUR SCHEME	COLOR: EMERALD	6" X 12"
W4	KRONOS OR EQUAL	TRELLIS	COLOR: T1: BLEND ICE 7215 T2: BLEND CLAY 7217	24" X 24"
W5	COMEX (KWAL) COLORLIFE OR EQUAL	PAINTED GYPSUM BOARD SATIN FINISH	COLOR NAME/NUMBER: P1 - CLW 1037W STONEY PLAIN P2 - CL 2335D PRAVDA P3 - COLOR MATCH EXISTING HOLLOW FRAMES - HOLLOW METAL DOORS/FRAMES ONLY	N/A
W6	MAHARAM OR EQUAL	VINYL WALLCOVERING WITH CUSTOM GRAPHIC STYLE: DIGITAL GRAPHICS SUBSTRATE: CANVAS	FULL COLOR CUSTOM GRAPHICS TO BE PROVIDED BY ARCHITECT	N/A

FINISH LEGEND

CODE	MANUFACTURER	PRODUCT		SIZE
		PRODUCT NAME/NUMBER	FINISH	
CEILINGS				
PAINTED GYP. BOARD CEILING AND SOFFIT				
C1	ROCK FACE OR EQUAL	ACOUSTICAL CEILING TILE STYLE: CLIMAPLUS, SQUARE LAY-IN TILE	COLOR NAME/NUMBER: WHITE	2' X 2'
C2	KWAL COLORLIFE	PAINTED GYPSUM BOARD FLAT FINISH	COLOR NAME/NUMBER: COLOR TO MATCH W5-P1 AS INDICATED ABOVE.	N/A
C3	KWAL COLORLIFE	EPOXY PAINTED GYPSUM BOARD CLEAN ROOMS, TOILET & SHOWER ROOM	COLOR NAME/NUMBER: COLOR TO MATCH W5-P1 AS INDICATED ABOVE.	N/A
CASEWORK				
SOLID SURFACE				
SS1	SAMSUMG	STARON COLOR: SANDED CREAM SM421	N/A	N/A
SS2	3 FORM	FIZZ COLOR: LAWN	FRONT FINISH: SUPERMATTE BACK FINISH: SUPERMATTE	N/A
PLASTIC LAMINATE				
PL1	NEVAMAR	MILLWORK AND INTERIOR WALL PANELS SANTA ROSA PLUM WZ2001T	ARMORED PROTECTION	N/A
PL2	NEVAMAR	PAINTED GYPSUM BOARD NEVAMAR: LEGENDARY TEAK WTOOO4T	ARMORED PROTECTION	N/A

SECTION 092115 - GYPSUM BOARD 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 the following:
 - 1. Nonload-bearing steel framing members for gypsum board assemblies.
 - 2. Gypsum board assemblies attached to steel framing.
 - 3. Tile Backer Board for wall tile installation.
 - 4. Sound Attenuation Batts for partitions as noted.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 7 Section "Firestopping" for firestopping systems and fire-resistance-rated joint sealants.
 - 2. Division 7 Section "Joint Sealers" for sealing all open joints.

1.3 DEFINITIONS

- A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA-505 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 ASSEMBLY PERFORMANCE REQUIREMENTS

- A. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those of assemblies whose STC ratings were determined according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.
- B. Fire Resistance: Provide gypsum board assemblies with fire-resistance ratings indicated.

1.5 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of product specified.
- C. Shop Drawings showing locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of Work. Locations of abuse resistant gypsum panels where applicable.

- D. Product certificates signed by manufacturers of gypsum board assembly components certifying that their products comply with specified requirements.

1.6 QUALITY ASSURANCE

- A. Single-Source Responsibility for Steel Framing: Obtain steel framing members for gypsum board assemblies from a single manufacturer, unless otherwise indicated.
- B. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.
- C. Single-Source Responsibility for Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.
- D. Fire-Test-Response Characteristics: Where fire-resistance-rated gypsum board assemblies are indicated, provide gypsum board assemblies that comply with the following requirements:
 - 1. Fire-Resistance Ratings: As indicated by GA File Numbers in GA-600 "Fire Resistance Design Manual" or design designations in UL "Fire Resistance Directory" or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 2. Gypsum board assemblies indicated are identical to assemblies tested for fire resistance according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
 - 3. Deflection and Firestop Track: Top runner provided in fire-resistance-rated assemblies indicated is labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

1.8 PROJECT CONDITIONS

- A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 requirements or gypsum board manufacturer's recommendations, whichever are more stringent.
- B. Room Temperatures: For nonadhesive attachment of gypsum board to framing, maintain not less than 40 deg F (4 deg C). For adhesive attachment and finishing of gypsum board, maintain not less than 50 deg F (10 deg C) for 48 hours before application and continuously after until dry. Do not exceed 95 deg F (35 deg C) when using temporary heat sources.
- C. Ventilation: Ventilate building spaces as required to dry joint treatment materials. Avoid drafts during hot, dry weather to prevent finishing materials from drying too rapidly.

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. Steel Framing and Furring:
 - a. Clark Steel Framing, Inc.
 - b. Consolidated Systems, Inc.
 - c. Dale Industries, Inc.
 - d. Dietrich Industries, Inc.
 - e. Marino/Ware (formerly Marino Industries Corp.).
 - f. National Gypsum Co.; Gold Bond Building Products Division.
 - g. SCAFCO Steel Stud Manufacturing Co.
 - h. Unimast, Inc.
 2. Grid Suspension Assemblies:
 - a. Armstrong World Industries, Inc.
 - b. Chicago Metallic Corp.
 - c. USG Interiors, Inc.
 - d. Worthington Steel Company (formerly National Rolling Mills).
 3. Gypsum Board and Related Products:
 - a. Domtar Gypsum.
 - b. Georgia-Pacific Corp.
 - c. National Gypsum Co.; Gold Bond Building Products Division.
 - d. United States Gypsum Co.

2.2 STEEL FRAMING COMPONENTS FOR SUSPENDED AND FURRED CEILINGS

- A. General: Provide components complying with ASTM C 754 for conditions indicated.
- B. Wire Ties: **ASTM A 641 (ASTM A 641M)**, Class 1 zinc coating, soft temper, **0.062 inch (1.6 mm)** thick.
- C. Wire Hangers: **ASTM A 641 (ASTM A 641M)**, Class 1 zinc coating, soft temper, **0.162-inch (4.1-mm)** diameter.
- D. Grid Suspension System for Interior Ceilings: ASTM C 645, manufacturer's standard direct-hung grid suspension system composed of main beams and cross-furring members that interlock to form a modular supporting network.

2.3 STEEL FRAMING FOR WALLS AND PARTITIONS

- A. General: Provide steel framing members complying with the following requirements:
1. Protective Coating: **ASTM A 653, G 40 (ASTM A 653M, Z 90)** hot-dip galvanized coating.

- B. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form **3/16-inch- (5-mm-)** wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:
1. Thickness: **0.0396 inch 20 gauge** as follows:
 - a. For head runner, sill runner, jamb, and cripple studs at door and other openings.
 2. Depth: As indicated.
 3. Equivalent thickness products including zee formed, and dimpled products are not permitted
- C. Deflection Track: Manufacturer's standard top runner designed to prevent cracking of gypsum board applied to interior partitions resulting from deflection of the structure above fabricated from steel sheet complying with **ASTM A 653 (ASTM A 653M)** or **ASTM A 568 (ASTM A 568M)**. Thickness as indicated for studs, and width to accommodate depth of studs, and of the following configuration:
1. Top runner with **2-1/2-inch- (63.5-mm-)** deep flanges that either have V-shaped offsets that compress when pressure is applied from construction above or have slots **1 inch (25.4 mm)** o.c. that allow fasteners attached to studs through the slots to accommodate structural movement by slipping.
 - a. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - 1) Superior Flex Track System (SFT); Delta Star, Inc.
 - 2) SLP-TRK; Metal-Lite, Inc.
- D. Deflection and Firestop Track: Top runner designed to allow partition heads to expand and contract with movement of structure above while maintaining continuity of the assembly. Comply with requirements of ASTM C 645 except configuration, of thickness indicated for studs and width to accommodate depth of studs indicated with flanges offset at midpoint to accommodate gypsum board thickness.
1. Offset Configuration: As indicated.
 2. Available Product: Subject to compliance with requirements, a product that may be incorporated in the Work includes, but is not limited to, "Fire Trak" manufactured by Fire Trak Corp.
- E. Steel Rigid Furring Channels: ASTM C 645, hat shaped, depth and minimum thickness of base (uncoated) metal as follows:
1. Thickness: **0.0336 inch (0.84 mm)**, unless otherwise indicated.
 2. Depth: **1-1/2 inch (38.1 mm)**.
- F. Steel Resilient Furring Channels: Manufacturer's standard product designed to reduce sound transmission, fabricated from steel sheet complying with **ASTM A 653 (ASTM A 653M)** or **ASTM A 568 (ASTM A 568M)** to form **1/2-inch- (12.7-mm-)** deep channel of the following configuration:
1. Double-Leg Configuration: Hat-shaped channel with **1-1/2-inch- (38.1-mm-)** wide face connected to flanges by double-slotted or expanded-metal legs (webs).

- G. Steel Channel Bridging: Cold-rolled steel, 0.0635-inch (1.5-mm) minimum thickness of base (uncoated) metal and 7/16-inch- (11.1-mm-) wide flanges, 1-1/2 inches (38.1 mm) deep, 475 lb/1000 feet (45 kg/100 m), unless otherwise indicated.
- H. Steel Flat Strap and Backing Plate: Steel sheet for blocking and bracing complying with ASTM A 653 (ASTM A 653M) or ASTM A 568 (ASTM A 568M), length and width as indicated, and with a minimum base metal (uncoated) thickness as follows:
 - 1. Thickness: 0.0635 inch (1.5 mm) where indicated.
- I. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.

2.4 GYPSUM BOARD PRODUCTS

- A. General: Provide gypsum board of types indicated in maximum lengths available that will minimize end-to-end butt joints in each area indicated to receive gypsum board application.
 - 1. Widths: Provide gypsum board in widths of 48 inches (1219 mm).
- B. Gypsum Wallboard: ASTM C 36 and as follows:
 - 1. Type: Type X
 - 2. Edges: Tapered and featured (rounded or beveled) for prefilling.
 - 3. Thickness: 5/8 inch (15.9 mm) where indicated.
- C. Gypsum Board Base Layer(s) for Multilayer Applications: Gypsum wallboard, ASTM C 36, and as follows:
 - 1. Type: Type X
 - 2. Edges: Manufacturer's standard.
 - 3. Thickness: 5/8 inch (15.9 mm) where indicated.

2.5 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.
 - 1. **Products:** Subject to compliance with requirements, [provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. CertainTeed Corp.; GlasRoc Tile Backer.
 - b. Georgia-Pacific Gypsum LLC; DensShield Tile Backer.
 - 2. Core: 5/8 inch (15.9 mm), Type X.
 - 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.6 TRIM ACCESSORIES

- A. Accessories for Interior Installation: Cornerbead, edge trim, and control joints complying with ASTM C 1047 and requirements indicated below:

1. Material: Formed metal or plastic, with metal complying with the following requirement:
 - a. Steel sheet zinc coated by hot-dip process or rolled zinc.
 2. Shapes indicated below by reference to Fig. 1 designations in ASTM C 1047:
 - a. Cornerbead on outside corners, unless otherwise indicated.
 - b. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim, unless otherwise indicated.
 - c. L-bead with face flange only; face flange formed to receive joint compound. Use L-bead where indicated.
 - d. U-bead with face and back flanges; face flange formed to be left without application of joint compound. Use U-bead where indicated.
 - e. One-piece control joint formed with V-shaped slot and removable strip covering slot opening.
 - f. Fry Reglet "W" reveal profile for areas as indicated
- B. Accessory for Curved Edges: Cornerbead formed of metal, plastic, or metal combined with plastic, with either notched or flexible flanges that are bendable to curvature radius.

2.7 JOINT TREATMENT MATERIALS

- A. General: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.
- B. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise indicated.
1. Use pressure-sensitive or staple-attached, open-weave, glass-fiber reinforcing tape with compatible joint compound where recommended by manufacturer of gypsum board and joint treatment materials for application indicated.
- C. Joint Compounds for Gypsum Board - one of the following types may be used at the Contractor's option.
- Setting type Factory-packaged, job-mixed, chemical-hardening powder products formulated for uses indicated.
1. For taping and filling only, use formulation that is compatible with other joint compounds applied over it.
 2. For prefilling gypsum board joints, use formulation recommended by gypsum board manufacturer.
 3. For filling joints and treating fasteners of water-resistant gypsum backing board behind base for ceramic tile, use formulation recommended by gypsum board manufacturer.
 4. For topping compound, use sandable formulation.
- D. Drying-Type Joint Compounds for Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.
1. Ready-Mixed Formulation: Factory-mixed product.
 - a. Taping compound formulated for embedding tape and for first coat over fasteners and face flanges of trim accessories.
 - b. Topping compound formulated for fill (second) and finish (third) coats.

- c. All-purpose compound formulated for both taping and topping compounds.

2.8 ACOUSTICAL SEALANT

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following requirements:
 - 1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

2.9 MISCELLANEOUS MATERIALS

- A. General: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.
- B. Fastening Adhesive for Metal: Special adhesive recommended for laminating gypsum panels to steel framing.
- C. Steel drill screws complying with ASTM C 1002 for the following applications:
 - 1. Fastening gypsum board to steel members less than 0.033 inch (0.84 mm) thick.
 - 2. Fastening gypsum board to gypsum board.
- D. Steel drill screws complying with ASTM C 954 for fastening gypsum board to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
- E. Steel drill screws of size and type recommended by unit manufacturer for fastening cementitious backer units.
- F. Sound-Attenuation Blankets: Unfaced mineral-fiber blanket insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing).
 - 1. Mineral-Fiber Type: Fibers manufactured from glass.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Ceiling Anchorages: Coordinate installation of ceiling suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorages to

building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.

1. Furnish concrete inserts and other devices indicated to other trades for installation well in advance of time needed for coordination with other construction.

3.3 INSTALLING STEEL FRAMING, GENERAL

- A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.
- B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Co.'s "Gypsum Construction Handbook."
 - a. Install deflection track top runner to attain lateral support and avoid axial loading.
 - b. Install deflection and firestop track top runner at fire-resistance-rated assemblies where indicated.
 - 1) Attach jamb studs at openings to tracks using manufacturer's standard stud clip.
- C. Do not bridge building control and expansion joints with steel framing or furring members. Independently frame both sides of joints with framing or furring members as indicated.

3.4 INSTALLING STEEL FRAMING FOR SUSPENDED AND FURRED CEILINGS

- A. Suspend ceiling hangers from building structural members and 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 ceiling suspension system. 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 the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
 3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
 4. Secure flat, angle, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for structure as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or otherwise fail.
 5. Do not attach hangers to steel deck tabs.
 6. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 7. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- B. Sway-brace suspended steel framing with hangers used for support.

- C. Install suspended steel framing components in sizes and at spacings indicated, but not less than that required by the referenced steel framing installation standard.
 - 1. Wire Hangers: 48 inches (1219 mm) o.c.
 - 2. Carrying Channels (Main Runners): 48 inches (1219 mm) o.c.
 - 3. Furring Channels (Furring Members): 16 inches (406 mm) o.c.
- D. Installation Tolerances: Install steel framing components for suspended ceilings so that cross-furring or grid suspension members are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) as measured both lengthwise on each member and transversely between parallel members.
- E. Wire-tie or clip furring members to main runners and to other structural supports as indicated.
- F. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

3.5 INSTALLING STEEL FRAMING FOR WALLS AND PARTITIONS

- A. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.
 - 1. Where studs are installed directly against exterior walls, install asphalt felt strips or foam gaskets between studs and wall.
- B. Installation Tolerances: Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8 inch (3 mm) from the plane formed by the faces of adjacent framing.
- C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
 - 1. For STC-rated and fire-resistance-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid structural surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed, to support gypsum board closures needed to make partitions continuous from floor to underside of solid structure.
- D. Terminate partition framing at suspended ceilings ONLY where indicated.
- E. Install steel studs and furring in sizes and at spacings indicated.
 - 1. Single-Layer Construction: Space studs 16 inches (406 mm) o.c., unless otherwise indicated.
 - 2. Multilayer Construction: Space studs 24 inches (610 mm) o.c., unless otherwise indicated.
- F. Install steel studs so flanges point in the same direction and leading edge or end of each gypsum board panel can be attached to open (unsupported) edges of stud flanges first.
 - 1. Position studs vertically with open sides facing in same direction and engaging floor and ceiling runners. Begin and end each arc with a stud and space intermediate studs equal-

ly along arcs at stud spacing recommended by gypsum board manufacturer for radii indicated. Attach studs to runners with **3/8-inch- (9.5-mm-)** long pan head framing screws. On straight lengths at ends of arcs, place studs **6 inches (150 mm)** o.c. with last stud left free standing.

- G. Frame door openings to comply with GA-219, and with applicable published recommendations of gypsum board manufacturer, unless otherwise indicated. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - 1. Install 2 studs at each jamb, unless otherwise indicated.
 - 2. Install cripple studs at head adjacent to each jamb stud, with a minimum **1/2-inch (12.7-mm)** clearance from jamb stud to allow for installation of control joint.
 - 3. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.
- H. Frame openings other than door openings to comply with details indicated or, if none indicated, as required for door openings. Install framing below sills of openings to match framing required above door heads.
- I. Install insulation as follows:
 - 1. Erect insulation vertically and hold in place with friction fit or supplemental clips if required.

3.6 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

- A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.
- B. Install sound-attenuation blankets, where indicated, prior to installing gypsum panels unless blankets are readily installed after panels have been installed on one side.
- C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- D. Install gypsum panels with face side out. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges and ends with not more than **1/16 inch (1.5 mm)** of open space between panels. Do not force into place.
- E. Locate both edge or 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. Avoid joints other than control joints at corners of framed openings where possible.
- F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- G. Attach gypsum panels to framing provided at openings and cutouts.
- H. Form control and expansion joints at locations indicated and as detailed, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.

- I. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases that are braced internally.
 - 1. Except where 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. (0.7 sq. m) in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect open structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- J. Isolate perimeter of nonload-bearing gypsum board partitions at structural abutments, except floors, as detailed. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- K. Where STC-rated gypsum board assemblies are indicated, seal construction at perimeters, behind control and expansion joints, openings, and penetrations with a continuous bead of acoustical sealant including a bead at both faces of the partitions. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.
- L. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.
 - 1. Space screws a maximum of 12 inches (304.8 mm) o.c. for vertical applications.
- M. Space fasteners in panels that are tile substrates a maximum of 8 inches (203.2 mm) o.c.

3.7 GYPSUM BOARD APPLICATION METHODS

- A. Single-Layer Application: Install gypsum wallboard panels as follows:
 - 1. On ceilings, apply gypsum panels prior to wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless parallel application is required for fire-resistance-rated assemblies. Use maximum-length panels to minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of board.
 - b. At stairwells and other high walls, install panels horizontally.
 - c. Install abuse resistant panels in corridors and classrooms to a height of 4'-0" AFF.
- B. Wall Tile Substrates: For substrates indicated to receive ceramic tile and similar rigid applied wall finishes, comply with the following:
 - 1. Where tile backing panels abut other types of panels in the same plane, shim surfaces to produce a uniform plane across panel surfaces.
- C. Multilayer Application on Ceilings: Apply gypsum board indicated for base layers prior to applying base layers on walls/partitions; apply gypsum wallboard face layers in same sequence. Off-

set face-layer joints one framing member, **16 inches (400 mm)** minimum, from parallel base-layer joints. Apply base layers at right angles to framing members, unless otherwise indicated.

- D. Multilayer Application on Partitions/Walls: Apply gypsum board indicated for base layers and gypsum wallboard 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. Stagger joints on opposite sides of partitions.
- E. Single-Layer Fastening Methods: Apply gypsum panels to supports as follows:
 - 1. Fasten with screws.
- F. Multilayer Fastening Methods: Apply base layers of gypsum panels and face layer to base layers as follows:
 - 1. Fasten both base layers and face layers separately to supports with screws.

3.8 INSTALLING TRIM ACCESSORIES

- A. General: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.
- B. Install cornerbead at external corners.
- C. Install edge trim where edge of gypsum panels would otherwise be exposed. Provide edge trim type with face flange formed to receive joint compound, except where other types are indicated.
 - 1. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
 - 2. Install L-bead where edge trim can only be installed after gypsum panels are installed.
 - 3. Install U-bead where indicated.
 - 4. Install aluminum trim and other accessories where indicated.
- D. Install control joints at locations indicated.
- E. Install control joints according to ASTM C 840 and manufacturer's recommendations and in specific locations approved by Architect for visual effect.

3.9 FINISHING GYPSUM BOARD ASSEMBLIES

- A. General: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.
- B. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.
- C. Apply joint tape over gypsum board joints, except those with trim accessories having flanges not requiring tape.
- D. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214.

1. Level 1 for ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
 2. Level 4 for gypsum board surfaces, unless otherwise indicated.
- E. Use the following joint compound combinations as applicable to the finish levels specified:
1. Embedding and First Coat: Setting-type joint compound. Fill (Second) Coat: Setting-type joint compound. Finish (Third) Coat: Sandable, setting-type joint compound.
- F. For Level 4 gypsum board finish, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration.
- G. Where Level 1 gypsum board finish is indicated, embed tape in joint compound.
- H. Finish tile backer units to comply with unit manufacturer's directions.

3.10 FIELD QUALITY CONTROL

- A. Above-Ceiling Observation: Architect will conduct an above-ceiling observation prior to installation of gypsum board ceilings and report any 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 one week in advance of the date and the time when the Project, or part of the Project, will be ready for an above-ceiling observation.
 2. Prior to 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.

3.11 CLEANING AND PROTECTION

- A. Promptly remove any residual joint compound from adjacent surfaces.
- B. Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure gypsum board assemblies are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 093100 - CERAMIC 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. Ceramic mosaic tile. thick-set . Large format in Colors as shown set over a waterproof membrane
 - 2. Porcelain wall tile. – large format with accents as shown.
 - 3. Stone thresholds installed as part of tile installations.
- B. Related Sections include the following:
 - 1. Division 3 Section "Cast-in-Place Concrete" for monolithic slab finishes specified for tile substrates.

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: Actual tile size (minor facial dimension as measured per ASTM C 499).

1.4 SUBMITTALS

- A. Product Data: For each type of tile, mortar, grout, and other products specified.
- B. Tile Samples for Initial 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 Initial Selection: Manufacturer's color charts consisting of actual sections of grout showing the full range of colors available for each type of grout indicated.
- D. Samples for Verification: Of each item listed below, prepared on Samples of size and construction indicated. Where products involve normal color and texture variations, include Sample sets showing the full range of variations expected.
 - 1. Each type and composition of tile and for each color and texture required, at least 12 inches (300 mm) square, mounted on braced cementitious backer units, and with grouted joints using product complying with specified requirements and approved for completed work in color or colors selected by Architect.
 - 2. Full-size units of each type of trim and accessory for each color required.
 - 3. Stone thresholds in 6-inch (150-mm) lengths.

- E. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- F. Product Certificates: Signed by manufacturers certifying that the products furnished comply with requirements.

1.5 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 Stone Thresholds: Obtain stone thresholds from one source and by a single manufacturer.

1.6 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.

1.7 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.

1.8 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 2 percent of amount installed, for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following and as scheduled on the Drawings:
 - 1. Tile Products:
 - a. As scheduled.
 - 2. Tile-Setting and -Grouting Materials:
 - a. American Olean Tile Company.
 - b. C-Cure Corporation.
 - c. Custom Building Products
 - d. Dal-Tile Corporation.
 - e. Mapei Corporation.
 - f. TEC Incorporated.

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 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 matching colors and patterns scheduled.
 - 2. Provide field colors from manufacturers standard colors
 - 3. Provide accents from manufacturers full range of colors
- 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.

2.3 TILE PRODUCTS

- A. Unglazed Porcelain Mosaic Tile for Floors (F5, F13): Provide factory-mounted flat tile complying with the following requirements:

1. Composition: Porcelain.
2. Module Size: 2 by 2 inches (50.8 by 50.8 mm) at Toilet rooms unless otherwise noted.
3. Nominal Thickness: 1/4 inch (6.35 mm).
4. Face: Plain with cushion edges.

Color to be selected from manufacturers full line.

Field Blend (60% field color 20% accent, 20% accent)

- B. Glazed Wall Tile: Provide flat tile complying with the following requirements:

1. Module Size: 12 x 24 inches
2. Module Size: 24 x 24 inches
3. Thickness: 5/16 inch (8 mm).

- C. 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 Cement Mortar Installations: Stainless cove trim
 - b. External Corners
 - c. Wainscot Cap: Trim.

2.4 STONE THRESHOLDS

- A. General: Provide stone 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. Fabricate thresholds to heights indicated, but not more than 1/2 inch (12.7 mm) above adjoining finished floor surfaces, with transition edges beveled on a slope of no greater than 1:2.

- B. Marble Thresholds: Provide marble thresholds complying with ASTM C 503 requirements for exterior use and with a minimum abrasive-hardness value of 10 per ASTM C 241.

1. Architect to select from Manufacturers full range.

2.5 WATERPROOFING MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.10, selected from the following.

- B. Fabric-Reinforced, Fluid-Applied Product: System consisting of liquid-latex rubber and fabric reinforcement.

1. Available Products:

- a. Custom Building Products; Trowel & Seal Waterproofing and Anti-Fracture Membrane.
- b. LATICRETE International Inc.; Laticrete 9235 Waterproof Membrane.
- c. MAPEI Corporation; PRP M19.
- d. Summitville Tiles, Inc.; S-9000.

2.6 SETTING MATERIALS

A. Chemical-Resistant, Water-Cleanable, Tile-Setting Epoxy: ANSI A118.3.

1. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 deg F (60 deg C) and 212 deg F (100 deg C), respectively, and certified by manufacturer for intended use.

B. 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. Latex Additive: Acrylic resin.
 - b. 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.

C. Medium-Bed, Latex-Portland Cement Mortar: Provide materials composed as follows, with physical properties equaling or exceeding those required for thin-set mortars based on testing of medium-bed specimens according to ANSI A118.4:

1. Prepackaged Dry-Mortar Mix: Factory-prepared mixture of portland cement; dry, redispersible, ethylene vinyl acetate additive; and other ingredients to which only water needs to be added at Project site.

2.7 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. Products: Subject to compliance with requirements, provide one of 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. Rhodorsil 6B White; Rhone-Poulenc, Inc.
 - e. Tremsil 600 White; Tremco, Inc.

2.8 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. 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.
- C. Temporary Protective Coating: **Either product** indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and 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 deg F (49 to 60 deg C) per ASTM D 87.
 - 2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

2.9 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- 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 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.

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. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA 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 patterns as 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. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated 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."
- G. Grout tile to comply with the requirements of the following tile installation standards:
 - 1. For chemical-resistant epoxy grouts, comply with ANSI A108.6.
 - 2. For ceramic tile grouts (sand-portland cement, dry-set, commercial portland cement, and latex-portland cement grouts), comply with ANSI A108.10.

3.4 WATERPROOFING MEMBRANE INSTALLATION

- A. Install waterproofing and crack suppression membrane to comply with ANSI A108.13 and waterproofing manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.

3.5 FLOOR TILE INSTALLATION

- A. General: Install tile to comply with requirements in the Ceramic Tile Floor Installation Schedule, including those referencing TCA installation methods and ANSI A108 series of tile installation standards.
- B. Joint Widths: Install tile on floors with the following joint widths:
 - 1. Ceramic Mosaic Tile: 1/16 inch (1.6 mm).
 - 2. Large Dimension ceramic Tile: ¼ 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. Quarry Tile in kitchen.
- D. Stone Thresholds: Install stone 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 nontile floor finish.
- C. Grout Sealer: Apply grout sealer to **cementitious** grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by wiping with soft cloth.

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 TCA installation methods and ANSI setting-bed standards.
- B. Joint Widths: Install tile on walls with the following joint widths:
 - 1. Wall Tile: 1/16 inch (1.6 mm).

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.
- 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, that ensure tile is without damage or deterioration at the time of Substantial Completion.
 - 1. 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.
 - 2. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.
- D.. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

3.7 CERAMIC TILE FLOOR INSTALLATION SCHEDULE

A. Ceramic Tile Floor Installation – Toilet rooms

- 1. Tile Type: tile on slab on grade
- 2. Installation Method –TCNA F121-12(epoxy mortar bed over waterproofing membrane) – modified to include epoxy mortar and grout for showers and wet walls. Extend waterproofing 8 inches up wall where substrate is metal studs and backer board.
- 3. Installation Method –TCNA F132-12(epoxy mortar bed bond coat and grout for toilet rooms.

Setting Bed and Grout: ANSI A118.5 with the following mortar and grout:

- a. Epoxy mortar.
- b. Epoxy grout

B. Ceramic Tile Floor Installation – Toilet rooms Elevated slabs

- 1.
 - 1. Tile Type: Unglazed ceramic mosaic tile
 - 2. Installation Method –TCNA F121-12(epoxy mortar bed over waterproofing membrane) – modified to include epoxy mortar and grout for showers and wet walls. Extend waterproofing 8 inches up wall where substrate is metal studs and backer board.
 - 3. Installation Method –TCNA F132-12(epoxy mortar bed bond coat and grout for toilet rooms Tile Type: Unglazed ceramic mosaic and porcelain tile on slab on grade
 - 4. Setting Bed and Grout: ANSI A108.5 with the following mortar and grout:
 - a. Epoxy mortar
 - b. Epoxy grout

3.8 CERAMIC TILE WALL INSTALLATION SCHEDULE

A. Ceramic Tile Wall Installation

1. Installation Method: TCNA W211-12 (cement mortar bed bonded to clean, sound, dimensionally stable masonry or cementitious backer units with waterproofing membrane).
2. Setting Bed and Grout: ANSI A108.1B with the following mortar and grout:
 - a. Latex-portland cement mortar.
 - b. Epoxy grout.

END OF SECTION

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

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 ceilings consisting of acoustical panels and exposed suspension systems – heavy duty to comply with IBC requirements.

1.3 SUBMITTALS

- A. Product Data: For each type of product specified.
- B. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
 - 1. Ceiling suspension system members.
 - 2. Method of attaching suspension system hangers to building structure.
 - 3. Ceiling-mounted items including light fixtures; air outlets and inlets; speakers; sprinklers; and special moldings at walls, column penetrations, and other junctures of acoustical ceilings with adjoining construction.
 - 4. Minimum Drawing Scale: **1/8 inch = 1 foot (1:96)**.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of actual acoustical panels or sections of acoustical panels, suspension systems, and moldings showing the full range of colors, textures, and patterns available for each type of ceiling assembly indicated.
- D. Samples for Verification: Full-size units of each type of ceiling assembly indicated; in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics.
 - 1. **6-inch- (150-mm-)** square samples of each acoustical panel type, pattern, and color.
 - 2. Set of **12-inch- (300-mm-)** long samples of exposed suspension system members, including moldings, for each color and system type required.
- 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. Product Test Reports: Indicate compliance of acoustical panel ceilings and components with requirements based on comprehensive testing of current products.

- G. Research/Evaluation Reports: Evidence of acoustical panel ceiling's and components' compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed acoustical panel ceilings 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 Ceiling Units: Obtain each acoustical ceiling panel from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
- C. Source Limitations for Suspension System: Obtain each suspension system from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
 - 1. Obtain both acoustical ceiling panels and suspension system from the same manufacturer.
- D. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
 - 1. Fire-response tests were performed by UL, ITS/Warnock Hersey, or another independent testing and inspecting agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.
 - 2. Surface-burning characteristics of acoustical panels comply with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.
 - 3. Fire-resistance-rated assemblies, which are indicated by design designations from UL's "Fire Resistance Directory," from ITS/Warnock Hersey's "Directory of Listed Products," or from the listings of another testing and inspecting agency, are identical in materials and construction to those tested per ASTM E 119.
 - 4. Products are identified with appropriate markings of applicable testing and inspecting agency.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels and suspension system components 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, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 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.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Acoustical Ceiling Units: Full-size units equal to 2.0 percent but not less than 4 panels minimum of amount installed for each panel type.
 - 2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated for each designation in the Acoustical Panel Ceiling Schedule at the end of Part 3.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
 - 1. Mounting Method for Measuring Noise Reduction Coefficient: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface per ASTM E 795.
- B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
 - 1. Where appearance characteristics of acoustical panels are indicated by referencing ASTM E 1264 pattern designations and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range of products that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

- C. Panel Characteristics: Comply with requirements indicated in the Acoustical Panel Ceiling Schedule at the end of Part 3, including those referencing ASTM E 1264 classifications.

2.3 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, heavy duty structural classification, and finishes indicated that comply with applicable ASTM C 635 requirements.
- B. Metal Suspension System Characteristics: Comply with requirements indicated in the Acoustical Panel Ceiling Schedule at the end of Part 3.
- C. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
- D. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated.
- E. Wire Hangers, Braces, and Ties: Provide wires at Contractor's option complying with the following requirements:
 - 1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 2. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
 - 3. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than yield stress of wire, but provide not less than ~~0.106-inch~~ (2.69-mm) diameter wire.
- F. 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.
 - 1. For circular penetrations of ceiling or bullnose corners, provide edge moldings fabricated to diameter required to fit penetration exactly. Exposed Face will not be stepped but shall match adjacent flat moldings. Flexible moldings may be used at bullnose corners.
 - 2. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Comply with paint manufacturer's written instructions for applying and baking and for minimum dry film thickness.
 - a. Organic Coating: Manufacturer's standard thermosetting coating system with a minimum dry film thickness of ~~0.8 to 1.2 mils~~ (0.02 to 0.03 mm).
 - b. Color: Match color of finish on flanges of suspension system surfaces.
 - 3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Armstrong World Industries, Inc.
 - b. Celotex Corporation (The); Building Products Division; Architectural Ceilings Marketing Dept.

- c. Chicago Metallic Corporation.
- d. Fry Reglet Corporation.
- e. Gordon, Inc.
- f. MM Systems, Inc.
- g. USG Interiors, Inc.

- G. Impact Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

2.4 ACOUSTICAL SEALANT

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following requirements:
 - 1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
- B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Acoustical Sealant for Exposed and Concealed Joints:
 - a. PL Acoustical Sealant; Chemrex, Inc., Contech Brands.
 - b. AC-20 FTR Acoustical and Insulation Sealant; Pecora Corp.
 - c. SHEETROCK Acoustical Sealant; United States Gypsum Co.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and other conditions affecting performance of acoustical panel ceilings.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
 2. 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., IBC Seismic Zone D.
- B. Suspend ceiling hangers from building's structural members and as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 3. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 5. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to powder-actuated fasteners, or drilled-in anchors that extend through forms into concrete.
 7. Do not attach hangers to steel deck tabs.
 8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 9. Space hangers not more than **48 inches (1200 mm)** o.c. along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than **8 inches (200 mm)** from ends of each member.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than **16 inches (400 mm)** o.c. and not more than **3 inches (75 mm)** from ends, leveling with ceiling suspension system to a tolerance of **1/8 inch in 12 feet (3 mm in 3.6 m)**. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

- F. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
 2. Paint cut panel edges remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 3. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.5 ACOUSTICAL PANEL CEILING SCHEDULE

- A. Water-Felted, Mineral-Base Acoustical Panels (C3) for Acoustical Panel Ceiling, provide non-fire rated and fire-resistance-rated if indicated. Acoustical panels, and complying with the following
1. Products: Provide the following:
 - a. USG Rock Face Clima-Plus
 - b. Armstrong Armatuff

Classification: Panels fitting ASTM E 1264 for Type III, mineral base with painted finish; Form 2, water felted.
 2. Pattern: Panels fitting ASTM E 1264 pattern designation (description) CE (perforated, small holes and textured.
 3. Color: White
 4. Light Reflectance Coefficient: Not less than LR 0.85
 5. Noise Reduction Coefficient: NRC 0.50-0.55
 6. Edge Detail: Square
 7. Thickness: 5/8 inch inimum
 8. Size: 24 x 24 inches (C3a) and 24 by 48 inches (C3b) as shown
- C. Suspension System for Acoustical Panel Ceiling, provide acoustical panel ceiling suspension system complying with the following
- 1 Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, G01 (Z001) coating designation, with pre-finished 15/16-inch- (24-mm-) wide metal caps on flanges; other characteristics as follows:
 - a. Structural Classification Heavy-duty system
 - b. End Condition of Cross Runners: Override (stepped) or butt-edge type, as standard with manufacturer

- c. Face Design: Flush face.
- d. Cap Material: Steel sheet for General areas
- e. Cap Finish: Painted white.
- f. Mounting method: With compression struts as indicated for seismic loading.
- g. Edge moldings: 2 inch leg with mechanical fasteners at one end of each area as required by IBC or Armstrong BERC Clips concealed in framing members if acceptable to Building Authority.

END OF SECTION

SECTION 096513 - 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 base.
 - 2. Resilient accessories as required for project conditions.

1.3 SUBMITTALS

- A. Product Data: For each type of product specified.
- B. Samples for Verification: In manufacturer's standard sizes, but not less than 12 inches (300 mm) long, of each product color and pattern specified.
- C. Product Certificates: Signed by manufacturers of resilient wall base and accessories certifying that each product furnished complies with requirements.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing resilient products similar to those required for this Project and with a record of successful in-service performance.
- B. Source Limitations: Obtain each type and color of product specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
- C. Fire-Test-Response Characteristics: Provide products with the following fire-test-response characteristics as determined by testing identical products per test method indicated below by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Critical Radiant Flux: 0.45 W/sq. cm or greater when tested per ASTM E 648.
 - 2. Smoke Density: Maximum specific optical density of 450 or less when tested per ASTM E 662.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to Project site in manufacturer's original, unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling

instructions.

- B. Store products in dry spaces protected from the weather, with ambient temperatures maintained between 50 and 90 deg F (10 and 32 deg C).
- C. Move products into spaces where they will be installed at least 48 hours before installation, unless longer conditioning period is recommended in writing by manufacturer.

1.6 PROJECT CONDITIONS

- A. Maintain a temperature of not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C) in spaces to receive resilient products for at least 48 hours before installation, during installation, and for at least 48 hours after installation, unless manufacturer's written recommendations specify longer time periods. After postinstallation period, maintain a temperature of not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- B. Do not install products until they are at the same temperature as the space where they are to be installed.
- C. For resilient products installed on traffic surfaces, close spaces to traffic during installation and for time period after installation recommended in writing by manufacturer.
- D. Coordinate resilient product installation with other construction to minimize possibility of damage and soiling during remainder of construction period. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated in the Resilient Base and Accessories Schedule at the end of Part 3.

2.2 RESILIENT BASE

- A. Rubber Wall Base: Products complying with FS SS-W-40, Type I and with requirements specified in the Resilient Base and Accessories Schedule.

2.3 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-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, areas, and conditions where installation of resilient products will occur, with Installer present, for compliance with manufacturer's requirements, including those for maximum moisture content. Verify that substrates and conditions are satisfactory for resilient product installation and comply with requirements specified. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with manufacturer's written installation instructions for preparing substrates indicated to receive resilient products.
- 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, using mechanical methods recommended by manufacturer. Do not use solvents.
- D. Broom and vacuum clean substrates to be covered immediately before installing resilient products. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. General: Install resilient products according to manufacturer's written installation instructions.
- B. Apply resilient wall base to walls and other permanent fixtures in rooms and areas where base is required.
 - 1. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
 - 2. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
 - 3. Do not stretch base during installation.
 - 4. Install premolded outside corners before installing straight pieces.
 - 5. Form inside corners on job, from straight pieces of maximum lengths possible, by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.
- C. Place resilient products so they are butted to adjacent materials and bond to substrates with adhesive. Install reducer strips at edges of flooring that would otherwise be exposed.

3.4 CLEANING AND PROTECTING

- A. Perform the following operations immediately after installing resilient products:
 - 1. Remove adhesive and other surface blemishes using cleaner recommended by resilient

- product manufacturers.
 2. Do not wash resilient products until after time period recommended by resilient product manufacturer.
 3. Damp-mop or sponge resilient products to remove marks and soil.
- B. Protect resilient products against mars, marks, indentations, and other 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 resilient product manufacturer.
- C. Clean resilient products not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean products according to manufacturer's written recommendations.

3.5 RESILIENT BASE AND ACCESSORIES SCHEDULE

- A. Rubber Wall Base: Where this designation is indicated, provide rubber wall base complying with the following:
1. Color: To be selected by Architect from manufacturer's full range.
 2. Style: Cove.
 3. Minimum Thickness: **1/8 inch (3.2 mm)**.
 4. Height: 4 inches.
 5. Lengths: Coils in lengths standard with manufacturer, but not less than **96 feet (29.26 m)**.
 6. Outside Corners: Field formed
 7. Surface: Smooth.
 8. Manufacturers: Burke Flooring, Roppe, Johnsonite.
- B. Resilient Accessories: Where this designation is indicated, provide accessories complying with the following:
1. Available Manufacturers: Johnsonite.
 2. Color and Pattern: As selected by Architect from manufacturer's full range of colors and patterns produced for accessories complying with requirements indicated.

END OF SECTION 096513

SECTION 096519 – RESILIENT TILE FLOORING

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. Vinyl composition Tile
- B. Related Sections:
 - 1. Division 09 Section "Resilient Base and Accessories" for resilient base, reducer strips, and other accessories installed with resilient floor coverings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 1. Show details of special patterns.
- C. Samples: Full-size units of each color and pattern of floor tile required.
- D. Samples for Initial Selection: For each type of floor tile indicated.
- E. Samples for Verification: Full-size units of each color and pattern of floor tile required.
- F. Product Schedule: For floor tile. **Use same designations indicated on Drawings.**

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.
- B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store floor tiles on flat surfaces.

1.8 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), 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. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

1.9 EXTRA 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. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

PART 2 - PRODUCTS

2.1 Vinyl Composition Tile: Provide vinyl composition floor tile complying with the following:

1. Tile Type IV Composition 1 FS SS-T-312 B
2. Color and Pattern: As selected by Architect
3. Class: Class 2 (through-pattern tile)
4. Wearing Surface: Smooth.
5. Thickness: 1/8 inch (3.2 mm).
6. Size: 12 by 12 inches (304.8 by 304.8 mm).
7. High Strength Tile providing a minimum 300 psi point loading when tested in accordance with modified ASTM F970 standard.
Manufacturers – Products and patterns as scheduled
Armstrong
Mannington,

2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.
 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Vinyl Tile Adhesives: Not more than 50 g/L.
- C. Floor Polish/Wax: Provide protective liquid floor polish or wax products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. 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 floor tile.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions 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. 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.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - 4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass 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. (1.36 kg of water/92.9 sq. m)** in 24 hours.
 - b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75% relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are same temperature as space where they are to be installed.
 - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles in pattern and direction shown on drawings.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles with grain direction, color pattern and size pattern of adjacent tiles as indicated on drawings and Finish Legend.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.
- B. Perform the following operations immediately after completing floor tile 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.
- C. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish/Wax: Remove soil, visible adhesive, and surface blemishes from floor tile surfaces before applying liquid floor polish or wax.
 - 1. Apply number of coats recommended by manufacturer.
- E. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 096813 – TILE 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. This Section includes carpet tile installation in colors/schemes designated for the Project for general areas a walk-off product at Entries
- B. Related Sections include the following:
 - 1. Division 9 Section "Resilient Flooring and Base" for resilient wall base and accessories installed with carpet tile.

1.3 SUBMITTALS

- A. Shop Drawings: Show the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
 - 2. Existing flooring materials to be removed.
 - 3. Existing flooring materials to remain.
 - 4. Carpet tile type, color, and dye lot.
 - 5. Type of subfloor.
 - 6. Type of installation.
 - 7. Pattern of installation.
 - 8. Pattern type, location, and direction.
 - 9. Pile direction.
 - 10. Type, color, and location of insets and borders.
 - 11. Type, color, and location of edge, transition, and other accessory strips.
 - 12. Transition details to other flooring materials.
- B. 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 Stripping and Accessory: **12-inch- (300-mm-)** long Samples.
- D. Substitutions
 - 1. Unless otherwise amended, no "value engineering" suggestions will be entertained on this item and bidders are expected to comply with these specifications.
 - 2. Products specified are for basis of design specification. Requests for product substitutions shall be submitted in prescribed form to the Architect for consideration 15 days prior to bid date. **Approved substitutions require a 20 sq. yard mock up of each color to be sup-**

plied and installed prior to bid date. No substitutions will be considered after this date. Colors and patterns shall match samples of those specified. Owner's representative will review responsible products exceeding the technical, color and pattern specifications listed herein no later than 15 days before bid opening. Any additional approvals will be issued by an addendum prior to bid date.

3. All Approved substitutions shall have minimum order of 1 box for samples. (5 to 6 yards)

4. Approved substitutions will be acknowledged in an addendum issued prior to bid date.

5. Consideration will be given to only those submittals containing samples, product specifications in the format used herein, and certified test reports to compliance with this section.

6. Samples shall be accompanied by the manufacturer's certification on company letterhead, certifying equal qualification with every requirement as specified herein and signed by an officer of the company.

F. Product Schedule: Use same room and product designations indicated on Drawings and in schedules.

G. Maintenance Data: For carpet tile to include in maintenance manuals specified in Division 1. 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.

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.

1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with CRI 104, Section 5, "Storage and Handling."

1.6 PROJECT CONDITIONS

A. General: Comply with CRI 104, Section 6.1, "Site Conditions; Temperature and Humidity."

B. Environmental Limitations: Do not install carpet tile 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 tile 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.

D. Where demountable partitions or other items are indicated for installation on top of carpet tile, install carpet tile 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 Tile Warranty: Written warranty, signed by carpet tile manufacturer agreeing to replace carpet tile that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet tile 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 Tile: Full-size units, not less than **10 sq. yd. (8.3 sq. m)**.

PART 2 - PRODUCTS

2.1 CARPET TILE

- A. Products: Purchased under State Contract
F1 – Walk-off Carpet Tile Mannington Ruffian Ebony Earth 1506 State contract MAQ2096

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and that is recommended by carpet tile manufacturer.
 - 1. VOC Limits: Provide adhesives that comply with the following limits for VOC content when tested according to ASTM D 5116:
 - a. Total VOCs: 10.00 mg/sq. m x h.
 - b. Formaldehyde: 0.05 mg/sq. m x h.
 - c. 2-Ethyl-1-Hexanol: 3.00 mg/sq. m x h.

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 tile performance. Verify that substrates and conditions are satisfactory for carpet tile 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 carpet tile manufacturer.
 - 2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.
 - 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, Section 6.2, "Site Conditions; Floor Preparation," and 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, 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 carpet tile manufacturer.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile. 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. General: Comply with CRI 104, Section 13, "Carpet Modules (Tiles)."
- B. Installation Method: As recommended in writing by carpet tile manufacturer for Glue-down; install every tile with releasable adhesive
- C. 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.
- D. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

- E. 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.
- F. Install pattern parallel to walls and borders unless otherwise indicated

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 carpet tile to comply with CRI 104, Section 15, "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 096813

SECTION 097200 - WALL COVERINGS

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. Vinyl wall covering with custom graphic pattern
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 9 Section "Painting" for priming wall surfaces.

1.3 ACTION SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of product specified. Include data on physical characteristics, durability, fade resistance, and flame-resistance characteristics.
- C. Shop Drawings showing location and extent of each wall covering type. Indicate seams and termination points.
- D. Samples for initial selection in the form of manufacturer's color charts consisting of actual units or sections of units showing the full range of colors, textures, and patterns available.
- E. Samples for verification in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics.
 - 1. Wall Covering Material: Full-width sample, not less than 36 inches (914 mm) long, from dye lot used for the Work.
 - a. Submit sample with specified treatments applied.
 - b. Mark top and face of material.
 - c. Show complete pattern repeat.
- F. Schedule of wall coverings using same room designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For wall coverings 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. Wall-Covering Materials: For each type, full-size units equal to **5** percent of amount installed. For custom graphic – compatible material to extend image field if damaged.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed 5 projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Fire-Test-Response Characteristics: Provide wall coverings 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: 25 or less.
 - 2. Smoke Developed: 450 or less.

1.7 PROJECT CONDITIONS

- A. Space Enclosure and Environmental Limitations: Do not install wall covering 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.
- B. Lighting: Do not install wall covering until a lighting level of not less than **15 foot-candles (160 lux)** is provided on the surfaces to receive wall covering.
- C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by the wall covering manufacturer for full drying or curing.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Rolls of Wall Covering Material: 7 Lineal yards of each type and pattern selected.

PART 2 - PRODUCTS

2.1 CUSTOM GRAPHIC

- A. Subject to compliance with requirements, provide custom printed vinyl wall coverings as shown in the drawings and finish schedules from the following manufacturers and product collections:
 - 1. Maharam in a custom printed pattern
- B. Additional manufacturers, subject to compliance with requirements, MAY include the following:
 - 1. DesignTex
 - 2. MDC Wallcoverings:
 - 3. Tri-Kex

2.2 ADHESIVES

- A. General: Mildew-resistant, nonstaining adhesive, for use with specific substrate application, as recommended by wall covering manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for moisture content and other conditions affecting performance of Work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair wall covering's bond, including mold, mildew, oil, grease, incompatible primers, and dirt.
- C. Prepare substrates to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, and defects.
 - 1. Painted Surfaces: Treat areas susceptible to pigment bleeding.
 - 2. Moisture Content: Maximum of 5 percent on new substrates
 - 3. Prime new gypsum board with primer recommended by wall covering manufacturer.
- D. Install wall liner, with no gaps or overlaps, where required by wall covering manufacturer. Form smooth wrinkle-free surface for finished installation. Do not begin wall covering installation until wall liner has dried.
- E. Acclimatize wall covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 INSTALLATION, GENERAL

- A. General: Comply with wall coverings manufacturers' written installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Cut wall covering in roll number sequence. Change run numbers at partition breaks and corners only.
- C. Install wall covering with no gaps or overlaps.
- D. Install seams vertical and plumb at least **6 inches (150 mm)** from outside corners and **3 inches (75 mm)** from inside corners. No horizontal seams.
- E. Remove air bubbles, wrinkles, blisters, and other defects.
- F. Trim edges for color uniformity, pattern match, and tight closure at seams and edges. Butt seams.

3.4 CLEANING

- A. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.
- B. Use cleaning methods recommended by wall covering manufacturer.
- C. Replace strips that cannot be cleaned.

END OF SECTION 097200

SECTION 099120 - PAINTING

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 surface preparation and field painting of the following:
 - 1. Doors and frames.
 - 2. Interior gypsum board assemblies.
 - 3. Exterior Steel
 - 4. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Low VOC coatings complying with Utah Administrative Code R307-361 are required as work of this Section.
- C. Related Sections include the following:
 - 1. Division 7 Section for Water Repellants and Anti-Graffiti coatings
 - 2. Division 7 Section "Joint Sealers" for sealing open joints in new construction.
 - 3. Division 8 Section "Steel Doors and Frames" for shop priming steel doors and frames.
 - 4. Division 9 Section "Gypsum Board Assemblies" for surface preparation for gypsum board.
 - 5. Division 9 section for High performance Coatings.
 - 6. Divisions 23 and 26: Painting of mechanical and electrical work other than exposed duct, piping and conduit as specified herein, is specified in Divisions 23 and 26, respectively.
- D. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.
 - 1 Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment. Include painting of exposed radial duct.
 - 2. Interior Painting includes application of joint sealants to all joints created by new construction including, but not limited to, edges of counters, door frames to walls, joints between plumbing fixtures and walls, countertops to walls etc.
- E. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
 - 1. Prefinished items include the following factory-finished components:
 - a. Architectural woodwork and casework.
 - b. Metal toilet enclosures.

- c. Finished mechanical and electrical equipment.
 - d. Light fixtures.
 - e. Distribution cabinets.
2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Furred areas.
 - b. Ceiling plenums.
 - c. Pipe spaces.
 - d. Duct shafts.
3. Finished metal surfaces include the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
4. Operating parts include moving parts of operating equipment and the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
5. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.3 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
 3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
 4. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
 5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.4 SUBMITTALS

- A. Product Data: For each paint system specified. Include block fillers and primers.
 1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.

3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
- B. Samples for Verification: Of each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
 1. Provide stepped Samples, defining each separate coat, including primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
 2. Provide a list of materials and applications for each coat of each sample. Label each sample for location and application.
 - a. Submit Samples for Architect's review of color and texture only
- C. Qualification Data: For firms and persons specified in the "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. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.
- B. Source Limitations: Obtain primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.
- C. 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

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
 1. Product name or title of material.
 2. Product description (generic classification or binder type).

3. Manufacturer's stock number and date of manufacture.
 4. Contents by volume, for pigment and vehicle constituents.
 5. Thinning instructions.
 6. Application instructions.
 7. Color name and number.
 8. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of **45 deg F (7 deg C)**. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.7 PROJECT CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between **50 and 90 deg F (10 and 32 deg C)**.
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between **45 and 95 deg F (7.2 and 35 deg C)**.
- C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than **5 deg F (3 deg C)** above the dew point; or to damp or wet surfaces.
1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

- A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the Owner.
1. Quantity: Furnish the Owner with extra paint materials in the quantities indicated below:
 - a. Interior, Low-Luster Acrylic Finish: 1 gals of each color applied.
 - b. Interior Epoxy coatings: 1 gal of each color applied
 - c. Interior, Semigloss Acrylic Enamel: **2 gal. (7.57 L)** of each color applied.
 - d. Interior Clear Coat: 5 gals.
 - e. Exterior, Semigloss Alkyd: 1 gal. of each color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in the paint schedules as a standard of quality for the work
- B. Manufacturers Names: The following manufacturers provide products that may be incorporated into the Work
 - 1. Benjamin Moore & Co. (Moore).
 - 2. Glidden Professional – Akzo Nobel
 - 3. Comex Paints
 - 4. PPG Industries, Inc. (PPG).
 - 5. Sherwin-Williams Co. (S-W).

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality premium paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
 - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- C. Colors: Provide color selections made by the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.
 - 1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - 2. Verify that all sealants have been applied in locations that abut areas to be painted.
 - 3. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

- 1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.
 - 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove and reprime.
 - 2. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.
 - a. Blast steel surfaces clean as recommended by paint system manufacturer and according to requirements of SSPC-SP 10.
 - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.
- D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
 - 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 - 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 - 3. Use only thinners approved by paint manufacturer and only within recommended limits.
- E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors, surface treatments, and finishes are indicated in the schedules.
 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 3. Provide finish coats that are compatible with primers used.
 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
 7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 8. Sand lightly between each succeeding enamel or varnish coat.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 2. Omit primer on metal surfaces that have been shop primed and touchup painted.
 3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and in occupied spaces.
- F. Mechanical items to be painted include, but are not limited to, the following:
 - 1. Piping, pipe hangers, and supports.
 - 2. Heat exchangers.
 - 3. Tanks.
 - 4. Ductwork.
 - 5. Insulation.
 - 6. Motors and mechanical equipment.
 - 7. Accessory items.
- G. Electrical items to be painted include, but are not limited to, the following:
 - 1. Conduit and fittings.
 - 2. Switchgear.
 - 3. Panelboards.
- H. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.
- I. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque 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.
- J. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.
- K. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

- A. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when paint is being applied:
 - 1. The Owner will engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.
 - 2. The testing agency will perform appropriate tests for the following characteristics as required by the Owner:
 - a. Quantitative material analysis.
 - b. Abrasion resistance.
 - c. Apparent reflectivity.
 - d. Flexibility.
 - e. Washability.
 - f. Absorption.
 - g. Accelerated weathering.

- h. Dry opacity.
 - i. Accelerated yellowness.
 - j. Recoating.
 - k. Skinning.
 - l. Color retention.
 - m. Alkali and mildew resistance.
- 3. The Owner may direct the Contractor to stop painting if test results show material being used does not comply with specified requirements. The Contractor shall remove non-complying paint from the site, pay for testing, and repaint surfaces previously coated with the rejected paint. If necessary, the Contractor may be required to remove rejected paint from previously painted surfaces if, on repainting with specified paint, the 2 coatings are incompatible.

3.5 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
 - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.6 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
 - 1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

PAINTING SCHEDULES

Design Standards are used to establish a level of quality for the work. Premium products equal in quality, of the other named manufacturers may be used. The use of a Design Standard is not to be construed as a limit of competition or a constraint of trade.

Design Standard is based upon products by Sherwin Williams

3.7 EXTERIOR PAINT SCHEDULE – VOC Limits apply to all coatings interior and exterior.

- A. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.
 - 1. Full -Gloss, Finish: 2 finish coats over a rust-inhibitive primer.

- a. Primer: Rust-inhibitive metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **1.3 mils** (0.033 mm).

1. **Primer:** Pro Industrial Pro-Cryl Universal Metal Primer, B66-310, <100 g/L VOC

- b. First and Second Coats: Gloss, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **3.0 mils** (0.076 mm).

1st coat: Water-Based Acrolon 100 Polyurethane Gloss, B65-700 series, <100 g/L VOC

2nd coat: Water-Based Acrolon 100 Polyurethane Gloss, B65-700 series, <100 g/L VOC

B. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated (galvanized) metal surfaces:

1. Semi- Gloss, Finish: 2 finish coats over a galvanized metal primer.

- a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **1.2 mils** (0.031 mm).

1. **Primer:** Pro Industrial Pro-Cryl Universal Metal Primer, B66-310, <100 g/L VOC

- b. First and Second Coats: Gloss, interior/exterior, alkyd enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **3.0 mils** (0.076 mm).

1st coat: Pro Industrial Acrylic Semi-Gloss, B66-650 series, <50 g/L VOC

2nd coat: Pro Industrial Acrylic Semi-Gloss, B66-650 series, <50 g/L VOC

3.8 INTERIOR PAINT SCHEDULE

A. Gypsum Board Walls and Ceilings: Provide the following over interior gypsum board wall and ceiling surfaces except as noted otherwise:

1. Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a primer.

- a. Primer: Latex-based, interior primer.

ProMar 200 Zero VOC Interior Latex Primer, B28W2600 0 g/L VOC

- c. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **2.8 mils** (0.071 mm).

1st coat: ProMar 200 Zero VOC Eg-Shel B26-2600 series, 0 g/L VOC

2nd coat: ProMar 200 Zero VOC Eg-Shel B26-2600 series, 0 g/L VOC

B. Gypsum Board: Toilet Rooms Walls and Ceilings - Epoxy Coating, 2 coats over a primer.

1. Primer:

Primer: ProMar 200 Zero VOC Primer, B28W2600, 0 g/L VOC

2. Two finish coats, applied at a dry film thickness not less than 1.5 mil dry film thickness.

1st coat: Pro Industrial Water-Based Epoxy Eg-Shel, B73-360 series, <50 g/L VOC

2nd coat: Pro Industrial Water-Based Epoxy Eg-Shel, B73-360 series, <50 g/L VOC

C. Masonry Units – Epoxy Coating.

1. Primer under high performance epoxy coatings applied at 75 square feet per gallon coverage

Primer: Loxon Concrete & Masonry Primer, A24W8300, <100 g/L VOC

2. Second and Third Coats applied at not less than 1.5 mil dry film thickness.

1st coat: Pro Industrial Water-Based Epoxy Eg-Shel, B73-360 series, <50 g/L VOC

2nd coat: Pro Industrial Water-Based Epoxy Eg-Shel, B73-360 series, <50 g/L VOC

Masonry Units – Clear Coat – Single coat

D. Ferrous Metal: Provide the following finish systems over ferrous metal:

1. Semigloss, Enamel Finish: One finish coat over an enamel undercoater and a primer.

- a. Primer: Quick-drying, rust-inhibitive, alkyd-based primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **1.5 mils (0.038 mm)**.

1. **Primer:** Pro Industrial Pro-Cryl Universal Primer, B66-310 series, <100 g/L VOC

- b. Finish Coat: Semigloss, enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **1.3 mils (0.033 mm)**.

1st coat: Pro Industrial Acrylic Semi-Gloss, B66-650 series, 0 g/L VOC

2nd coat: Pro Industrial Acrylic Semi-Gloss, B66-650 series, 0 g/L VOC

E. Dryfall Coating: Exposed structural framing and deck:

Primer: Pro Industrial Pro-Cryl Universal Primer, B66-310 series, <100 g/L VOC

1st coat: Low VOC Waterborne Acrylic Dryfall, Flat B42W81, Eg-Shel B42W82, Semi-Gloss, B42W83,

2nd coat: Low VOC Waterborne Acrylic Dryfall, Flat B42W81, Eg-Shel B42W82, Semi-Gloss, B42W83,

All sheens <50 g/L VOC

END OF SECTION 099120

SECTION 099600 - HIGH-PERFORMANCE COATINGS - EXTERIOR

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 surface preparation and field application of high-performance coating systems to exterior structural steel .
- B. Compatible primer is a requirement for steel to be coated as work of this Section.
- C. Low VOC coatings complying with Utah Administrative Code R307-361 are required as work of this Section.
- D. Related Sections include the following:
 - 1. Division 5 Section "Structural Steel" for shop priming structural steel.
 - 2. Division 5 Section "Formed-Metal Fabrications" for shop-primed ferrous metal.
 - 3. Division 8 Section for Cellular skylight panels covering the canopy structures.
 - 4. Division 9 Section for Painting

1.3 DEFINITIONS

- A. Standard coating terms defined in ASTM D 16 apply to this Section.
- B. Gloss ranges used in this Section include the following:
 - 1. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
 - 2. High gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.
- C. Environments: The following terms are used in Part 2 of this Section to distinguish between different corrosive exposures:
 - 1. "Moderate environments" are corrosive industrial atmospheres with intermittent exposure to high humidity and condensation, occasional mold and mildew development, and regular cleaning with strong chemicals. Environments with exposure to heavy concentrations of chemical fumes and occasional splashing and spilling of chemical products are moderate environments.

1.4 SUBMITTALS

- A. Product Data: For each coating system indicated. Include block fillers and primers.

1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference the specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each material specified.
- B. Certification by manufacturer that products supplied comply with requirements indicated that limit the amount of VOCs in coating products.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.
1. After color selection, Architect will furnish color chips for surfaces to be coated.
- D. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate.
1. Provide stepped Samples defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
 2. List of material and application for each coat of each sample. Label each sample for location and application.
 3. Submit samples on the following substrates for Architect's review of color and texture:
 - a. Ferrous and Nonferrous Metal: Provide two ~~4-inch-~~ (100-mm-) square samples of flat metal and two ~~8-inch-~~ (200-mm-) long samples of solid metal for each color and finish.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced applicator who has completed high-performance coating system applications similar in material and extent to those indicated for Project and whose work has a record of successful in-service performance.
- B. Source Limitations: Obtain primers and undercoat materials for each coating system from the same manufacturer as the finish coats.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label with the following information:
1. Name or title of material.
 2. Product description (generic classification or binder type).
 3. Manufacturer's stock number and date of manufacture.
 4. Contents by volume, for pigment and vehicle constituents.
 5. Thinning instructions.
 6. Application instructions.
 7. Color name and number.
 8. Handling instructions and precautions.

- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.
 - 1. Protect materials from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and applying coatings.

1.7 PROJECT CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 45 and 95 deg F (7 and 35 deg C).
- B. Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
 - 1. Allow wet surfaces to dry thoroughly and attain temperature and conditions specified before proceeding with or continuing coating operation.
 - 2. Work may continue during inclement weather only if areas and surfaces to be coated are enclosed and temperature within the area can be maintained within limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

- A. Furnish extra high-performance coating materials from the same production run as materials applied and in quantities described below. Package coating materials in unopened, factory-sealed containers for storage and identify with labels describing contents.
 - 1. Quantity: Furnish extra coating materials in quantities indicated below:
 - a. High-Gloss, Polyurethane Enamel: Five gallons of each color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products indicated in the coating system descriptions.
- B. Manufacturers' Names: The following manufacturers are referred to in the coating system descriptions by shortened versions of their names shown in parenthesis:
 - 1. Sherwin Williams; Industrial and Marine Coatings (S-W).
 - 2. Tnemec Company, Inc. (Tnemec).

2.2 COATINGS MATERIALS, GENERAL

- 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.
 - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- C. VOC Classification: Provide high-performance coating materials, including primers, undercoats, and finish-coat materials, that have a VOC classification of 450 g/L or less.

2.3 COLORS

- A. Colors: Match Architect's samples.

2.4 EXTERIOR HIGH-PERFORMANCE COATING SYSTEMS

- A. Coating systems in this article are based on "MPI Architectural Painting Specification Manual." For renovation projects, consult "MPI Maintenance Repainting Manual" and revise coating systems accordingly.
- B. Exterior Exposed Steel Substrates:
"Pigmented Polyurethane over Inorganic Zinc-Rich Primer and High-Build Epoxy System"
 - 1. Shop Surface Preparation: SSPC-SP6/NACE 3 Commercial Blast Cleaning with a minimum angular anchor profile of 1.5 mils
 - 2. Shop Applied Prime Coat: Tnemec, Tneme-Zinc 90-97 at 2.5 – 3.5 mils dft
 - 3. Field Surface Preparation for areas of bare steel or damaged shop applied primer: Clean the area in accordance with SSPC-SP1 Solvent Cleaning. After Solvent Cleaning, prepare the surface in accordance with SSPC-SP11 Power Tool Cleaning to Bare Metal.
 - 4. Field Touch-up Primer: Tnemec Hydro-Zinc Series 94H20 at 2.5 – 3.5 mils dft
 - 5. Intermediate Coat: Tnemec Hi-Build Epoxoline Series V69 at 3.0 – 5.0 mils dft
 - 6. Finish Coat: Tnemec UVX Series 740/750 at 3.0 – 4.0 mils dft

PART 3 - EXECUTION

3.1 EXAMINATION

- A. With Applicator present, examine substrates and conditions under which high-performance coatings will be applied, for compliance with coating application requirements.

1. Apply coatings only after unsatisfactory conditions have been corrected and surfaces to receive coatings are thoroughly dry.
 2. Start of application is construed as Applicator's acceptance of surfaces within that particular area.
- B. Coordination of Work: Review other Sections in which primers or other coatings are provided to ensure compatibility of total systems for various substrates. On request, furnish information on characteristics of specified finish materials to ensure compatible primers.
1. If a potential incompatibility of primers applied by others exists, obtain the following from the primer Applicator before proceeding:
 - a. Confirmation of primer's suitability for expected service conditions.
 - b. Confirmation of primer's ability to be top coated with materials specified.
 2. Notify Architect about anticipated problems before using the coatings specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.
1. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.
- B. Cleaning: Before applying high-performance coatings, clean substrates of substances that could impair bond of coatings. Remove oil and grease before cleaning.
1. Schedule cleaning and coating application so dust and other contaminants from cleaning process will not fall on wet, newly coated surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be coated according to manufacturer's written instructions for each substrate condition and as specified.
1. Provide barrier coats over incompatible primers or remove primers and reprime substrate.
 2. Ferrous-Metal Substrates: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC recommendations.
 - a. Blast-clean steel surfaces as recommended by coating manufacturer and according to SSPC-SP 10/NACE No. 2.
 - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire brush, solvent clean, and touch up with same primer as the shop coat.
- D. Material Preparation: Carefully mix and prepare coating materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying coatings in a clean condition, free of foreign materials and residue.
 2. Stir materials before applying to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into the material. Remove film and, if necessary, strain coating material before using.
 3. Use only the type of thinners approved by manufacturer and only within recommended limits.
- E. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- A. General: Apply high-performance coatings according to manufacturer's written instructions.
1. Use applicators and techniques best suited for the material being applied.
 2. Do not apply high-performance coatings over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to forming a durable coating film.
 3. Coating colors, surface treatments, and finishes are indicated in the coating system descriptions.
 4. Provide finish coats compatible with primers used.
 5. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convactor covers, grilles, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
 - a. Coat surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
 - b. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- B. Scheduling Coating: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for coating as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and film thickness required is the same regardless of application method.
 - a. Omit primer on metal surfaces that have been shop primed and touchup painted.
 - b. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.
 - c. Where manufacturer's written instructions require sanding, sand between applications to produce a smooth, even surface.
 - d. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until coating has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat does not cause undercoat to lift or lose adhesion.
 2. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance. Give special attention to edges, corners, crevices, welds, exposed fasteners, and similar surfaces to ensure that they receive a dry film thickness equivalent to that of flat surfaces.

- C. Application Procedures: Apply coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
 - 1. Brush Application: Use brushes best suited for material applied and of appropriate size for the surface or item being coated.
 - a. Apply primers and first coats by brush unless manufacturer's written instructions permit using roller or mechanical applicators.
 - b. Brush out and work brush coats into surfaces in an even film.
 - c. Eliminate cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Neatly draw glass lines and color breaks.
 - 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by manufacturer for the material and texture required.
 - 3. Spray Equipment: Use mechanical methods to apply coating if permitted by manufacturer's written instructions and governing regulations.
 - a. Use spray equipment with orifice size recommended by manufacturer for material and texture required.
 - b. Apply each coat to provide the equivalent hiding of brush-applied coats.
 - c. Do not double back with spray equipment building-up film thickness of two coats in one pass, unless recommended by manufacturer.
- D. Minimum Coating Thickness: Apply each material no thinner than manufacturer's recommended spreading rate. Provide total dry film thickness of the entire system as recommended by manufacturer.
- E. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by manufacturer, to material required to be coated or finished that has not been prime coated by others.
 - 1. Recoat primed and sealed substrates if there is evidence of suction spots or unsealed areas in first coat, to ensure a finish coat with no burn-through or other defects caused by insufficient sealing.
- F. Completed Work: Match approved Samples for color, texture, and coverage. Remove, refinish, or recoat work that does not comply with specified requirements.

3.4 CLEANING

- A. Cleanup: At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
 - 1. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

3.5 PROTECTION

- A. Protect work of other trades, whether being coated or not, against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

1. Provide "Wet Paint" signs to protect newly coated finishes. After completing coating operations, remove temporary protective wrappings provided by others to protect their work.
2. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces. Comply with procedures specified in PDCA P1.

END OF SECTION

SECTION 101429 –DIMENSIONAL LETTER 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. Dimensional letters for exterior school Identification as shown.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Temporary Facilities" for temporary project identification signs.
 - 2. Division 9 Section for Field applied finish.
 - 3. Division 22 Section "Mechanical Identification" for labels, tags, and nameplates for mechanical equipment.
 - 4. Division 26 Section "Electrical Identification" for labels, tags, and nameplates for electrical equipment.
 - 5. Division 26 Section "Interior Lighting" for illuminated exit signs.

1.3 SUBMITTALS

- A. 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 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.
 - 2. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.
 - 3. Templates: Furnish full-size spacing templates for individually mounted dimensional letters and numbers.
- 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 initial selection of color, pattern, and texture:

- a. Dimensional Letters: Provide full-size representative samples of each dimensional letter type required, showing letter style, color, and material finish and method of attachment.

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. Design Concept: The Drawings indicate sizes, profiles, and dimensional requirements of signs and are based on the specific types 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 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Cutout Characters : Characters with uniform faces; square-cut, smooth edges; precisely formed lines and profiles; and as follows:
 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. [ACE Sign Systems, Inc.](#)
 - b. [APCO Graphics, Inc.](#)
 - c. [A. R. K. Ramos Signage Systems.](#)
 - d. [ASI Sign Systems, Inc.](#)
 - e. [Charleston Industries, Inc.](#)
 - f. [Diskey Sign Company.](#)
 - g. [Gemini Incorporated.](#)
 - h. [InPro Corporation.](#)
 - i. [Matthews International Corporation](#); Bronze Division.
 - j. [Metal Arts](#); Division of L & H Mfg. Co.
 - k. [Metallic Arts.](#)
 - l. [Nelson-Harkins Industries.](#)
 - m. [Southwell Company \(The\).](#)
 - n. [Steel Art Company.](#)
 2. Character Material: Sheet or plate **steel**.

3. Character Height: **As indicated**
4. Thickness: **0.50 inch (6.35 mm)**.
5. Finishes:
 - a. Integral Metal Finish: **Mill** for field finish
6. Mounting: Pin mounted vertically and Welded to supports indicated
7. Typeface: Helvetica

2.2 DIMENSIONAL LETTERS AND NUMBERS

- A. Cutout Letters Form individual letters and numbers by casting. Produce characters with smooth, flat faces and edges, sharp corners, and precisely formed lines and profiles, free from pits, scale, sand holes, or other defects. Comply with requirements indicated for finish, style, and size.
 1. Metal: Steel.
 2. Font: Helvetica.
 3. Letter Height:
 - a. 12 inch high: "HIGHLAND JUNIOR HIGH"

2.3 FINISHES

- A. Surface Textures: For exposed sign material that requires selection of materials related to appearance provide samples for Architects review..

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 distortion or other defects in appearance.
- B. Dimensional Letters: Mount letters and numbers using fastening methods recommended by the manufacturer for letter form, type of mounting, and condition of exposure indicated. Provide heavy paper template to establish letter spacing and to locate individual letters.
 1. Projected Mounting: Mount characters at projection distance from wall surface indicated.

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 102113 – METAL TOILET COMPARTMENTS

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 screens as follows:
 - 1. Type: Baked enamel.
 - 2. Screen Style: Floor to ceiling anchored.
- B. Related Sections include the following:
 - 1. Division 10 "Toilet and Bath Accessories" for toilet paper holders, grab bars, purse shelves, and similar accessories.

1.3 SUBMITTALS

- A. Product Data: For each type and style of toilet compartment and screen specified. Include details of construction relative to materials, fabrication, and installation. Include details of anchors, hardware, and fastenings.
- B. Shop Drawings: For fabrication and installation of toilet compartment and screen assemblies. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show locations of reinforcement and cutouts for compartment-mounted toilet accessories.
- C. Samples for Verification: Of each compartment or screen color and finish required, prepared on ~~6-inch-~~ (150-mm-) square Samples of same thickness and material indicated for Work.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions in areas of installation 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 units without field measurements. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.

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, but are not limited to, the following:
1. Accurate Partitions Corporation.
 2. Ampco Products, Inc.
 3. Bobrick Washroom Equipment, Inc.
 4. General Partitions Mfg. Corp.
 5. Hadrian Inc.
 6. Metpar Corp.
 7. Partition Systems, Inc.; Columbia Partitions.
 8. Weis/Robart Partitions, Inc.

2.2 MATERIALS

- A. General: Provide materials that have been selected for surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are unacceptable.
- B. Baked-Enamel Units: Facing sheets and closures fabricated from **ASTM A 653/A 653M (hot-dip galvanized or galvanized)**, commercial steel sheet for exposed applications, that is mill phosphatized, and selected for smoothness.
1. Facing Sheet Thicknesses: Minimum base-metal (uncoated) thicknesses as follows:
 - a. Pilasters, Braced at Both Ends: Manufacturer's standard thickness, but not less than **0.0329 inch (0.85 mm)**.
 - b. Pilasters, Unbraced at One End: Manufacturer's standard thickness, but not less than **0.0438 inch (1.1 mm)**.
 - c. Panels: **Manufacturer's standard thickness, but not less than 0.0269 inch (0.7 mm)**
 - d. Doors: Manufacturer's standard thickness, but not less than **0.0269 inch (0.7 mm)**.
 - e. Integral-Flange, Wall-Hung Urinal Screens: Manufacturer's standard thickness, but not less than **0.0269 inch (0.7 mm)**.
 2. Finish: Manufacturer's standard pigmented, organic coating, including thermosetting, electrostatically applied, and powder coatings. Provide coating system that complies with coating manufacturer's written instructions for pretreatment, application, baking, and minimum dry film thickness.
 - a. Color: **One color** in each room as selected by Architect from manufacturer's full range of colors.
- C. Core Material for Metal-Faced Units: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of **1 inch (25 mm)** minimum for doors, panels, and screens and **1-1/4 inches (32 mm)** minimum for pilasters.
- D. Pilaster Shoes and Sleeves (Caps): ASTM A 666, Type 302 or 304 stainless steel, not less than **0.0312 inch (0.8 mm)** thick and **3 inches (75 mm)** high, finished to match hardware.

- E. Full-Height (Continuous) Brackets: Manufacturer's standard design for attaching panels and screens to walls and pilasters of the following material:

- 1. Material: Stainless steel.

- F. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.3 FABRICATION

- A. Floor to Ceiling Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for floor mounting and connection to structural support above finished ceiling. Provide assemblies that support pilasters from structure without transmitting load to finished ceiling. Provide sleeves (caps) at tops of pilasters to conceal anchorage.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, plumb, and level. Provide clearances of not more than 1/2 inch (13 mm) between pilasters and panels and not more than 1 inch (25 mm) between panels and walls. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Secure panels to walls and panels with not less than 2 stirrup brackets attached near top and bottom of panel. Locate wall brackets so holes for wall anchors occur in masonry or tile joints. Align brackets at pilasters with brackets at walls.
- B. Screens: Attach with anchoring devices according to manufacturer's written instructions and to suit supporting structure. Set units level and plumb and to resist lateral impact.

3.2 ADJUSTING AND CLEANING

- A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and swing doors in entrance screens to return to fully closed position.
- B. Provide final protection and maintain conditions that ensure toilet compartments and screens are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 102113

Highland Jr High School Remodel

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SECTION 22 0000 - GENERAL PLUMBING PROVISIONS

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 SCOPE OF WORK

- A. The scope of the work under this contract includes the removal and replacement of plumbing fixtures indicated on the drawings. Any work reasonably inferable or required to result in a complete installation or the intended operation and performance of the systems, shall be included in the Bid except where there is specific reference to exclusion and incorporation in other quotations.
- B. The scope of the work under this contract includes the removal of all galvanized water supply piping in the indicated restrooms including all galvanized piping in the plumbing chases and accessible walls; replacing the galvanized piping with new copper water lines.
- C. The scope also includes the removal and replacement of the existing cast iron waste and vent lines serving any new plumbing fixtures including the removal of all existing fixtures supports, carriers, cast iron or galvanized waste and vent piping

1.3 INTENT OF DRAWINGS

- A. Provide complete and functional systems for the project. The systems shall conform to the details stated in the specifications and shown on the drawings. Items or work not shown or specified, but required for complete systems, shall be provided and conform with accepted trade practices. The drawings and specifications are presented to define specific system requirements and serve to expand on the primary contract requirements of providing complete systems. The drawings are diagrammatic and indicate the general arrangement and routing of the systems included in this contractors work.
- B. Do not scale the drawings. Because of the scale of the drawings, it is not possible to indicate all offsets, fittings, valves, or similar items which may be required to provide complete operating systems. Carefully investigate existing conditions affecting the work associated with this project. Check and verify dimensions and existing conditions at the site. Install systems in such a manner that interferences between pipes, conduit, ducts, equipment, architectural and structural features are avoided. Provide items required to meet the project conditions without additional cost to the owner.
- C. These documents may not explicitly disclose final details required for a complete systems installation; however, contractors shall possess the expertise to include the necessary appointments of complete operating systems.

1.4 PRE-BID SITE VISIT

- A. Prior to bidding the contractor shall schedule and visit the site and become completely familiar with existing conditions prior to submitting their bid. The contractor is cautioned that plumbing work in narrow plumbing chases is required as part of this work and should take this into consideration when submitting their bid. No extra charges shall be allowed as a result of existing conditions.

1.5 GENERAL STANDARDS OF MATERIALS

- A. Equipment and materials, unless otherwise noted, shall be new and of first quality, produced by manufacturers who have been regularly engaged in the manufacture of these products for a period of not less than five years.
- B. Equipment or plumbing fixtures shall be the products of one manufacturer; similar items of the same classification shall be identical, including equipment, assemblies, parts and components.

1.6 PRODUCTS AND SUBSTITUTIONS

- A. Where several manufacturers' products are specified, the Contract Amount shall be based upon the specified products only.

1.7 APPLICABLE CODES

- A. Materials furnished and work installed shall comply with applicable local and state of Utah codes, the requirements of the local utility companies and with the requirements of governmental departments or authorities having jurisdiction.

1.8 CODES, PERMITS AND INSPECTIONS

- A. Materials furnished and work installed shall comply with the latest versions of the International Plumbing Code, the International Building Code, the International Energy Conservation Code, the National Fire Protection Association, requirements of the local utility companies, and with authorities having jurisdiction.
- B. Plumbing Contractor shall provide labor, materials, services, apparatus and drawings required to comply with applicable laws, ordinances, rules and regulations, whether or not shown on the drawings and/or specified.
- C. Plumbing contractor shall obtain and pay for required permits and fees associated with approval and installation of plumbing systems and associated appurtenances and shall provide all additional information and materials required or requested by the Code Official.

1.9 GUARANTEES AND CERTIFICATES

- A. Defective equipment, materials or workmanship, including damage to the work provided under other divisions of this contract, shall be replaced or repaired at no extra cost to the Owner for the duration of the stipulated guarantee periods.
 - 1. Unless specifically indicated otherwise, the duration of the guarantee period shall be one (1) year following the date of Substantial Completion. Temporary operation of the equipment for temporary conditioning, testing, etc., prior to occupancy will not be considered part of the warranty period.

1.10 TEMPORARY SHUTDOWN OF EXISTING SYSTEMS

- A. Plan installation of new work and connections to existing work to insure minimum interference with regular operation of existing systems. Some temporary shutdown of existing systems may be required to complete the work.
- B. Submit to the Owner in writing for approval, proposed date schedule, time, and duration of necessary temporary shutdowns of existing systems. Submit schedule at least fifteen (15)

calendar days in advance of intended shutdown.. The Owner reserves the right to cancel shutdowns at any time prior to the shutdowns.

1.11 COORDINATION

- A. The Plumbing Contractor shall carefully coordinate his work with other trades to avoid conflicts, interruption of services and disruption of the construction schedule. Coordination drawings, when requested by the engineer, shall be developed and provided by the plumbing contractor from individual system shop drawings and contractor fabrication drawings. Coordination drawings shall be provided at no extra cost to the Owner.
- B. Electronic or other reproduced engineering design drawings used as coordination drawings are not acceptable.
- C. When work is installed without proper coordination, changes to this work deemed necessary by the Engineer shall be made to correct the conditions without extra cost to the Owner.

1.12 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

- A. Shop drawings, product data, and samples shall be submitted in accordance with the provisions of Division 1.
- B. The following shall be submitted by the Contractor for review:
 - 1. Shop drawings showing system components with sizing indicated, including but not limited to:
 - a. Fixtures and trim
 - b. Piping
 - c. Hangers, anchors and guides
 - 2. Product data for system components and materials (including construction standards).
 - 3. Samples of finishes and trim exposed to view, such as cleanout plates, fixture trim, escutcheon plates and similar items.

1.13 OWNER INSTRUCTION

- A. After final tests and adjustments have been completed, furnish the services of qualified personnel to instruct representatives of the Owner in the operation and maintenance procedures for equipment and systems installed as part of this project.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 22 0000

SECTION 22 0200 – PLUMBING DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Demolition, removal, relocation, rerouting, reconnection, salvage and disposal of existing plumbing equipment, fixtures and materials.
 - 2. Abandonment in place of inaccessible plumbing equipment and piping systems.
 - 3. Disconnecting, capping, abandoning in-place and removal of plumbing piping.
 - 4. Disposition and salvaging plumbing items for reuse by owner.

1.2 DEFINITIONS

- A. Demolish or Remove: Items designated to be demolished or removed are to be removed complete, transported off site and legally disposed of. Includes the removal of designated plumbing equipment, piping and their appurtenances.
- B. Remove and Salvage: Remove and salvage to owner indicated plumbing equipment. Includes careful removal, cleaning, packing, identifying, protecting and delivering plumbing items designated to be salvaged to the owner.
- C. Remove and Reinstall: Remove and reinstall indicated plumbing equipment. Includes careful removal, cleaning, protecting against damage and reinstalling of plumbing equipment and their associated appurtenances in the location indicated.
- D. Existing to Remain: Plumbing equipment or items indicated to remain shall be protected against damage during demolition operation.

1.3 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of the Contractor.

1.4 SUBMITTALS

- A. Schedule of Building Demolition Activities: Include the following:
 - 1. Demolition Schedule. Detailed sequence of demolition work, with starting and ending dates for each activity.
 - 2. Submit a list of items to be removed, salvaged and delivered to Owner prior to start of demolition.
- B. Pre-Demolition Documentation: Contractor shall video tape or photograph existing conditions of plumbing systems, equipment, fixtures, adjoining construction and site improvements, including finished surfaces, which might be misconstrued as damage caused by building demolition operations. Notify owner of any existing damages, anomalies, failures or incongruities of existing plumbing systems prior to starting demolition work.

1.5 PROJECT CONDITIONS

- A. Areas of work and plumbing systems to be demolished will be vacated and their use discontinued before start of the Work. Notify owner 72 hours in advance of demolition activities that will affect operations of adjacent occupied spaces.
- B. Areas of the building immediately adjacent to demolition areas may be occupied. Coordinate with building owner to limit transmittance of dust and noise during demolition operations. Conduct building demolition so operations of occupied areas will not be disrupted.
- C. Owner assumes no responsibility for condition of plumbing equipment or systems to be demolished. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

1.6 SALVAGE

- A. Before building demolition, Contractor will remove and salvage the following items to the owner:
 - 1. Existing wall hung lavatories and their faucets.
- B. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. If materials suspected of containing hazardous materials are encountered, do not disturb; stop work and immediately notify Architect and Owner. Hazardous materials will be removed by Owner under separate contract.
- C. On-site storage or sale of removed items or materials is not permitted.

PART 2 - PRODUCTS (Not Used)

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.

3.2 PREPARATION

- A. Furnish demolition schedule to owner and architect..
- B. Review plumbing equipment and fixtures to be removed with Architect and Owner prior to commencing work.
- C. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving plumbing equipment to be demolished.
- 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.

3.3 DEMOLITION, GENERAL

- A. Drawings: Demolition drawings are diagrammatic and do not indicate in detail the full extent of plumbing demolition work required. Prior to bidding, contractor shall visit project site to determine full extent of required plumbing demolition work and shall include costs for such work in his bid.
- B. General: Demolish indicated existing plumbing equipment and associated appurtenances 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 adequate ventilation when using cutting torches.
 3. Remove demolished equipment, debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

3.4 DEMOLITION OF PLUMBING SYSTEMS

- A. Proceed with demolition of plumbing systems logically and systematically. Prioritize and remove un-used plumbing equipment and piping systems first. Remove functioning plumbing equipment, fixtures, systems and piping, secondarily. Complete plumbing equipment demolition operations before disturbing next system scheduled to be removed.
- B. Remove connected piping systems back to a convenient location and cap.
- C. Abandonment: Abandonment of demolished plumbing equipment or piping above accessible ceiling systems or in plumbing spaces is prohibited. Remove all accessible and un-used plumbing equipment and piping systems that are not re-used as part of the new work.
- D. Abandonment in Place: Where indicated or where inaccessible conditions occur, abandon inaccessible plumbing piping in walls, above ceilings or below-grade. Cut plumbing piping flush with wall or ceiling and cap. Below grade plumbing piping shall be cut below grade and capped.
- E. Pipe Caps and Flanges: Active or continued piping systems that are disconnected, from plumbing systems to be demolished, shall be capped or flanged with same or similar piping material. Caps and flanges shall be sealed with appropriate gaskets or sealants to prevent leakage after pressure is restored. Properly identify pipe termination or label remaining pipe within 5 feet of pipe termination regarding pipe contents.
- F. Remove plumbing systems complete including all associated piping and ductwork systems, insulation systems, equipment and piping supports, controls and both line and low voltage electrical systems.

3.5 INSULATION

- A. Existing insulation covering plumbing equipment or piping scheduled to be removed shall be carefully removed prior to demolishing of the equipment or piping.
- B. Remove all material including insulation around joints, valves and fittings.
- C. Asbestos Laden Insulation: If insulation material is encountered or suspected of containing asbestos fibers, stop work immediately and notify architect and/or owner regarding disposition of insulation systems. Owner will retain and contract with a qualified asbestos abatement contractor for the identification, removal and proper disposal of asbestos containing materials and insulation from the project.

3.6 RESTORATION

- A. Areas in which plumbing equipment or systems have been demolished shall be restored and prepared in general for new plumbing work. Voids in floors, walls and ceilings resulting from plumbing demolition operations, shall be in filled with like or approved sealant materials or covered with appropriate cover plates.
- B. Openings through fire rated assemblies shall be in filled and caulked with UL listed intumescent caulk to maintain the assembly's fire rating.

3.7 REPAIRS

- A. Promptly repair damage to adjacent plumbing systems 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.

3.9 CLEANING

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

END OF SECTION 23 0200

SECTION 22 0500 - COMMON WORK FOR PLUMBING

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. Excavating
 - 2. Cutting and Patching.
 - 3. Waterproofing.
 - 4. Accessibility.
 - 5. Cleaning, Protection and Adjustment.
 - 6. Welding.
 - 7. Dielectric Fittings
 - 8. Piping connections

1.3 EXCAVATING

- A. Sawcut existing slabs, excavate and backfill as required for the installation of this work.
- B. Excavations shall be done on an unclassified basis. No extra payment shall be allowed regardless of type or hardness of material encountered.
- C. No backfilling shall be done on any plumbing system requiring testing or inspection until such testing or inspection has been completed satisfactorily.
- D. Remove from the site surplus excavated materials resulting from work. Surplus excavated materials include materials not suitable for use as backfill.

1.4 CUTTING AND PATCHING

- A. Provide cutting and patching necessary to install the work specified herein. Patching shall match adjacent surfaces.
- B. No structural members shall be cut without prior approval of the Architect.

1.5 WATERPROOFING

- A. Where work pierces floors and roofs, waterproofing, shall be required. Furnish necessary sleeves, barriers, caulking and flashing required to make openings absolutely watertight.

1.6 ACCESSIBILITY

- A. Coordinate with the existing conditions and the general contractor to ensure the sufficiency of the size of chases, and the adequacy of clearances in hung ceilings and other areas required for the proper installation of this work.

- B. Locate piping systems which must be serviced, operated or maintained in fully accessible positions. Equipment requiring access shall include, but is not necessarily limited to, valves, traps, clean-outs, drain points, etc.

1.7 CLEANING, PROTECTION AND ADJUSTMENT

A. Cleaning

1. General cleaning requirements are specified in Division 1.
2. Upon completion of the work, clean the exterior surface of equipment, accessories, and trim installed. Clean, polish, and leave equipment, accessories, and trim in first-class condition.
3. Equipment and material, if left unprotected and damaged, shall be repainted or otherwise refurbished at the discretion of the Owner.
4. During the construction period, protect piping, fittings, valves, equipment, and associated appurtenances from damage and dirt. Each system of piping shall be flushed to remove grit, dirt, sand, and other foreign matter for as long a time as required to thoroughly clean the systems.

B. Adjustment

1. After the entire installation has been completed, make required adjustments to balancing valves, circulating systems, pressure reducing valves and similar devices until performance requirements are met.

1.8 WELDING

A. General Requirements

1. Certified welders, previously certified by test, may be accepted for the work without re-certification provided that all of the following conditions are fulfilled:
 - a. Submit copies of welder certification test records in accordance with this Division and Division 1 requirements.
2. Filler metals, electrodes, fluxes and other welding materials shall be delivered to the site in manufacturers' original packages and stored in a dry space until used. Packages shall be properly labeled and designed to give maximum protection from moisture and to assure safe handling.
3. Submit welding certificates for review. Each welder assigned to work covered by this specification shall be certified by performance tests using equipment, positions, procedures, base metals, and electrodes or bare filler wires.

1.9 DIELECTRIC FITTINGS

- A. Ferrous to non-ferrous pipe connections shall be made with threaded, soldered, plain, or welded end connections that match piping system material. Dielectric fittings shall prevent any electrolytic action between dissimilar materials.

1.10 PIPING CONNECTIONS

A. Make pipe connections according to the following

1. Provide unions in supply piping systems 4 inches and smaller:

- a. Adjacent to each side of valve

PART 2 - PRODUCTS

2.1 WELDING

- A. Welding materials shall comply with the "ASME Boiler and Pressure Vessel Code." Welding equipment, electrodes, welding wire, and fluxes shall be capable of producing satisfactory welds when used by a certified welder using qualified welding procedures.

2.2 DIELECTRIC FITTINGS

- A. Dielectric unions shall be factory – fabricated assemblies with a minimum working pressure as required to suit system pressures.
- B. Manufacturers
 - 1. Watts Industries
 - 2. Zurn Industries
 - 3. Sioux Chief Industries

PART 3 - EXECUTION

3.1 WELDING

- A. Perform welding in accordance with qualified procedures using certified welders. Welding shall not be done when the quality of the completed weld could be impaired by the prevailing working or weather conditions. Welding of hangers, supports, and plates to structural members shall conform to AWS specifications.

END OF SECTION 22 0500

SECTION 22 0523 - PLUMBING VALVES

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 GENERAL

- A. Provide manual valves as shown on the drawings, specified herein, and as required for proper control and maintenance of plumbing systems and equipment.
- B. Valves shall be the product of one manufacturer.
- C. Valves shall be of same minimum working pressure and materials as specified for fittings of the system in which they are installed. Regardless of service, valves shall be designed for a minimum 125 psi working pressure.
- D. Install valves in accessible locations. Install valves in plumbing chases 60 inches above finished floor.
- E. Valves for equipment shutoff shall be size of pipe indicated on the drawings before reducing to equipment size.

1.3 SUMMARY

- A. This section includes the following:
 - 1. Ball Valves

PART 2 - PRODUCTS

2.1 BALL VALVES

- A. Ball valves 3 inches and smaller shall be: 600 psi non-shock cold water, ASTM B124, C37700 two piece brass, forging body and end piece, brass alloy blow out proof stem, free floating chromium plated brass ball, TFE seats, and full port opening.
- B. Manufacturer and Model: (Soldered End Connections)
 - 1. Crane Valve. – Model 9323
 - 2. Hammond Valve. – Model 8311
 - 3. Watts Industries, Inc. – Model B-6001
 - 4. Apollo Valve – Model 77C-200

PART 3 - EXECUTION

3.1 GENERAL

- A. Provide pipe connections at valves and equipment in accordance with Specification Section 22 0500 Common Work For Plumbing.

- B. Provide shut-off valves at each plumbing fixture and / or equipment requiring plumbing service regardless of whether shown on the drawings.
- C. Install valves so that the tops of the valve stems are above the horizontal.

END OF SECTION 22 0523

SECTION 22 0529 - PLUMBING HANGERS, SUPPORTS, AND SLEEVES

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 HANGERS AND SUPPORTS

- A. Provide hangers and supports for supporting plumbing piping as required herein.

1.3 SLEEVES

- A. Provide sleeves as specified herein.

1.4 ESCUTCHEONS

- A. Provide escutcheons as specified herein.

1.5 SUMMARY

- A. This section includes the following:
 - 1. Hangers and supports
 - 2. Sleeves
 - 3. Escutcheons
 - 4. Flashing

PART 2 – PRODUCTS

2.1 HANGERS AND SUPPORTS

- A. General
 - 1. Hanger design and installation shall conform to Federal Specification WWH-171; Manufacturers Standardization Society ANSI / MSS–SP–58; and installed in accordance with ANSI / MSS–SP-69.
 - 2. Field fabricated trapeze hangers with suspension rods having double nuts and securely attached to the construction may be provided instead of separate clevis hangers.
 - 3. Plastic-coated hangers and clamps shall be provided for un-insulated copper pipe unless shields are provided between hangers or clamps and pipe.
 - 4. Provide steel required for support of pipes. Plumbers tape, chain straps, perforated bars, wire hangers or expansion shields are not permitted.
 - 5. Rigid hangers for horizontal piping shall provide a means of vertical adjustment after erection.
 - 6. Hangers or supports shall be provided for existing piping that is to remain in areas affected by demolition.
 - 7. Vertical piping shall utilize riser clamps specifically designed for piping.

B. Hanger Rod Schedules

<u>Pipe Size</u>	<u>Minimum Rod Size</u>
Up to 2 inches	3/8 inch diameter
2-1/2 inches to 4 inches	1/2 inch diameter

2.2 SLEEVES

A. Provide sleeves for piping passing through walls, floors, ceilings, roofs and other building parts. Sleeves shall be securely fastened to the assembly penetrated.

1. Through penetration of fire-resistance-rated floor and roof assemblies

- a. Annular space between sleeves and pipes shall be protected by an approved through-penetration fire stop system installed and tested in accordance with ASTN E814.
- b. Sealant in one-hour and two-hour floors shall UL listed and installed in accordance with manufacturer's recommendations.
- c. Manufacturer (Sealant)
 - 1) Dow Corning
 - 2) Pro Set
 - 3) Hilti

2. Through penetrations of non-fire-resistance-rated walls and floors.

- a. Annular space between sleeves and pipes in non-fire-resistance-rated assemblies shall be filled or tightly caulked in an approved manor.
- b. Manufacturer (Sealant)
 - 1) Dow Corning
 - 2) Pro Set
 - 3) Hilti

B. Piping shall be installed to prevent strains and stress that exceed the structural strength of the pipe.

C. Where piping is provided through holes, notches in studs, joists, rafters, or other similar members and is less than 1.5 inches from the nearest edge of the member, the pipe shall be protected by shield plates. Protective shield plates shall be a minimum of 0.062 inch thick steel and shall cover the area of the pipe that is closer than 1.5 inches from edge.

D. Schedule of Sleeve Materials

<u>Sleeve Type</u>	<u>Sleeve Material</u>
1	18 gauge galvanized steel
2	Std. weight galvanized steel pipe
3	Std. weight galvanized steel pipe with a continuously welded water stop of 1/4 inch steel plate extending a minimum of 2 inches from the outside of the

<u>Sleeve Type</u>	<u>Sleeve Material</u>
	sleeve.
4	Std. weight galvanized steel pipe with flashing clamp device welded to pipe sleeve or watertight sleeves.

2.3 ESCUTCHEON PLATES

1. Schedule of Escutcheon Plate Materials

<u>Location</u>	<u>Escutcheon Plate Material</u>
Finished spaces	Anodized aluminum or chrome-plated brass
Unfinished spaces	Plain brass, cast iron or aluminum

PART 3 – EXECUTION

3.1 GENERAL

- A. Provide provision for expansion and contraction, on the hangers and through sleeves to prevent undue stress or strain on piping, building anchor points, and connected equipment or fixtures.

3.2 PIPE HANGERS AND SUPPORTS

A. Pipe Hanger Support Schedule

<u>Building Construction</u>	<u>Pipe Support Method</u>
Building structural steel	Beam attachments and similar devices
Concrete slabs where piping revisions are required and approved after slabs are poured or existing slabs	"Phillips" or "Hilti" expansion bolts and shields for piping 4 inches and smaller, with main supports welded to structural steel at maximum 20 feet on center 4 inch x 4 inch x 3/8 inch thick clip knee angles with 3/4 inch expansion bolt in shear (horizontal) and supporting rod at 90° from anchor bolt for piping greater than 4 inches, attached to concrete beams or columns

B. Pipe Support Spacing

<u>Piping Material</u>	<u>Maximum Horizontal Spacing</u>	<u>Maximum Vertical Spacing</u>
Cast Iron Pipe	5 Feet	15 Feet
Copper or copper-alloy pipe,	12 Feet	10 Feet
Copper or copper-alloy tubing, 1-1/4 inch diameter and smaller	6 Feet	10 Feet
Copper or copper-alloy pipe, 1-1/2 inch diameter and larger	10 Feet	10 Feet

1. Provide hangers no more than 12 inches from direction changes.

3.3 PIPE SLEEVES

- A. Grout sleeves to building structure for watertight fit.

3.4 PIPE FLASHING

- A. Pipe passing through roof construction shall be arranged to provide a minimum of 12 inches clearance from walls or other obstructions so as to permit proper flashing.

END OF SECTION 22 0529

SECTION 22 0553 - IDENTIFICATION FOR PIPING, VALVES AND 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. This section includes the following:
 - 1. Pipe identification – Interior

PART 2 - PRODUCTS

2.1 PIPE IDENTIFICATION

- A. Interior
 - 1. Pipe bands indicating contents and flow direction shall be flexible vinyl film with acrylic pressure sensitive adhesive suitable for pipe surface temperatures of -40°F to 220°F.
 - 2. Manufacturer and Model
 - a. Seton - Opticode
 - b. W.H. Brady - B-350 Perma-Code
 - c. Bunting - Identiflow

PART 3 - EXECUTION

3.1 PIPE IDENTIFICATION

- A. Pipe identification shall be as follows:
 - 1. Piping shall have direction of flow arrows matching the legend and background colors adjacent to each marker and at branches.
 - 2. Pipe identification shall be placed on piping at 20 foot maximum intervals. In addition, wherever a pipe passes through a wall, floor, or ceiling, it should be identified on each side of the wall, floor, or ceiling.
- B. Colors for pipe marking systems shall be in accordance with ANSI standards.
- C.

END OF SECTION 22 0553

SECTION 22 0719 - PLUMBING PIPE AND EQUIPMENT INSULATION

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 GENERAL

- A. Insulation shall have composite fire and smoke hazard ratings (including insulation, jacket or facing, PVC covers, and adhesives), as tested by ASTM E84, NFPA 255 or UL 723 procedures, not exceeding a flame spread rating of 25 and smoke developed rating of 50.
- B. Piping tests shall be completed before insulation proceeds.

1.3 INSULATION

- A. Piping systems, which includes existing piping that may need re-insulation, including flanges, fittings, valves, expansion joints, drains and appurtenances shall be insulated as specified herein.

1.4 ADHESIVES AND COATINGS

- A. Provide adhesives and coating as specified herein.

1.5 SUMMARY

- A. This section includes the following
 1. Domestic cold water piping insulation
 2. Domestic hot water piping insulation
 3. Adhesives and Coatings

PART 2 - PRODUCTS

2.1 PIPING SYSTEM INSULATION SCHEDULE

Piping System	Insulation Type	Minimum Insulation Thickness	Notes
Domestic cold water mains, risers, and branch piping	P-1	1 inch	
Domestic hot water mains, risers and branch piping	P-1	1 inch for piping 2 inches and smaller; 1-1/2 inch for pipes larger than 2 inches	

2.2 TYPE P-1 GLASS FIBER

- A. Insulation, including fiberglass fitting inserts, shall be glass fiber with a maximum K factor of .24 at 75°F mean temperature with factory applied all-service jacket with self-sealing lip. Exposed pipe insulation material must be the one piece type. Sectional type may be used for concealed piping.
- B. Seal butt joints with 3 inch wide butt stripe adhered neatly in place.
- C. Fittings and valves for all piping shall be insulated with preformed fiberglass inserts of the same density as the pipe insulation and finished with a PVC fitting cover. Provide one fiberglass insert per fitting or valve for each 1 inch of piping insulation specified. Field cut or loose blanket insulation is not acceptable.
- D. Exposed piping shall be finished with a factory attached all-service jacket, protected with two 1/16 inch coats of Childers CP/10 or CP/11 weather barrier coating.

2.3 ADHESIVES AND COATINGS

- A. Manufacturer and Model

	Insulcoustic	Benjamin-Foster	Childers
Vapor Barrier Adhesive	225	80-07	CP-54
Vapor Barrier Coating	501	30-35	CP-30
Lagging Adhesive	102	30-36	CP-52
Insulation Adhesive	225	85-20	CP-54
Glass Cloth Adhesive	225	85-20	CP-54
Weatherproofing Mastic	VI-AC	48-00	CP-10/11

PART 3 - EXECUTION

3.1 GENERAL

- A. Insulation shall be applied on clean, dry surfaces.
- B. Insulation shall be continuous through hangers, construction openings, and sleeves.
- C. Insulation on cold surfaces where vapor barrier jackets are required shall be applied with a continuous, unbroken vapor seal. Hangers, supports, anchors and similar devices that are secured directly to cold surfaces shall be adequately insulated and vapor sealed to prevent condensation.
- D. For pipe handling fluids below 70°F, provide one of the following means of preventing contact between pipe insulation and hanger or support:
 - 1. High density rigid fiberglass insulation insert, equal in thickness to pipe insulation, with factory applied jacket and metal protection shield. Protection shield shall be installer provided between pipe and hanger or support.
 - a. For piping 5 inches in diameter and smaller protection shield width shall be 18 gauge and equal to 1/2 the outside insulation diameter and 12 inches in length.

- E. For piping handling fluids 70°F and above, rest pipe directly on hanger, insulate pipe and hanger.
- F. Apply insulation in accordance with manufacturer's recommendations.

END OF SECTION 22 0719

SECTION 22 1116 - DOMESTIC WATER PIPING

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. Domestic Water Piping – Interior
 - 2. Installation and Testing
- B. Remove and replace all galvanized hot and cold water piping serving designated restroom areas with new copper pipe, fittings and valves.

PART 2 – PRODUCTS

2.1 PIPING AND FITTINGS MATERIAL SCHEDULE

- A. Domestic water systems shall be constructed of the following materials.

- 1. Domestic Water Piping – Interior

Pipe:	Type L hard drawn copper – ASTM B75, ASTM B88, ASTM B251, ASTM B447
Fittings:	Standard wrought copper – ASME B16.15, ASME B16.18, ASME B16.22, ASME B16.23, ASME B16.26, ASME B16.29, ASME B16.32
Joints:	4 inches and smaller - 95/5 tin antimony solder – ASTM B32.
Manufacturer:	Nibco; Mueller

PART 3 – EXECUTION

3.1 GENERAL

- A. Remove all galvanized cold and hot water piping from plumbing chases, walls and from above ceilings.
- B. Locate existing galvanized hot and cold water piping mains in utility tunnels or inside plumbing chases. Connect new copper pipe to existing galvanized mains as indicated. Provide dielectric unions at each point of connection.
- C. Extend new copper pipe to all new and existing plumbing fixtures as indicated. Install copper pipe to fixtures per manufacturer's instructions.
- D. Piping connections to plumbing fixtures and equipment shall be provided with offsets, unions, and shutoff valves arranged such that equipment can be serviced or removed without dismantling the pipe.
- E. Pitch water piping up in direction of flow to ensure adequate flow without air binding and to prevent noise and water hammer.
- F. Pressed type fittings and valving equal to Victaulic PressFit are permitted in piping systems.

3.2 INSTALLATION AND TESTING

A. Installation Procedures

- 1. Water piping shall be arranged to drain to low points and to provide for air elimination at high points.
- 2. Piping installed in plumbing chases shall be run as high as possible to provide for a minimum of 7'-0" clearance from bottom of piping to floor.
- 3. Mains, risers and branch connections to same shall be arranged to permit expansion and contraction without strain by means of elbow swings and/or expansion joints.
- 4. Valves, check valves, reducing valves, shock absorbers, tempering valves, etc. shall be easily accessible for maintenance and/or removal.
- 5. Ferrous to non-ferrous pipe connections shall be made with dielectric pipe union isolating joints to prevent any electrolytic action between dissimilar metals.
- 6. Copper pipe and tubing shall be cut square and reamed out to remove burrs. Outside and inside of the fittings and outside of the tubing at each end shall be well cleaned with steel wool before brazing to remove traces of oxidation regardless of how clean the surfaces of the pipe and fittings may appear.

B. System Pressure Test

- 1. Each water system shall be tested to a hydrostatic pressure equal to 1-1/2 times the system normal operating pressure of 60 psig.
- 2. The water used for the pressure test shall be supplied from a potable water source.
- 3. Take all due precautions to prevent damage to the building and its contents that may be incurred by such tests; repair or make good any damage caused by the tests.
- 4. Tests shall apply full test pressure to the piping for a minimum of 15 minutes to detect leaks and defects.

5. Tests shall be conducted prior to the installation of insulation.
6. The section of piping to be tested shall be brought up to the specified test pressure. If the test pressure falls more than the specified amount during the test period, the point of leakage shall be found, repaired and the test repeated. This procedure shall be repeated until the piping system has been proved absolutely tight.
7. Leaks shall be repaired by removing the valve, fitting, joint or section that is leaking and reinstalling new materials and joints as specified. Use of mastic or "no-leak" compounds or other temporary means of repairing leaks shall not be permitted.

C. Cleaning, Flushing and Disinfection

1. Before being placed in operation, the water piping systems shall be cleaned, flushed and disinfected in strict accordance with the requirements of the local health department or other authorities having jurisdiction.
2. The piping systems shall be sterilized with a solution containing not less than 50 parts per million of chlorine, which shall conform to the standards of the American Water Works Association, and the solution shall be introduced into the system in an approved manner. The solution shall be allowed to remain in the system for a minimum period of 24 hours. During the sterilization period, valves and outlets shall be opened and closed several times. After the sterilization period, the solution shall be flushed from the system using clean water until the residual chlorine content is less than 0.2 parts per million, or as required by the local health department or other authority having jurisdiction.

3.3 ADJUSTING AND BALANCING

- A. After completion of the installations and prior to acceptance by the Owner, water systems and appurtenances shall be adjusted and balanced to deliver the water quantities as specified, indicated on the drawings, or as directed.

END OF SECTION 22 1116

SECTION 22 1119 - DOMESTIC WATER PIPING SPECIALTIES

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 GENERAL

- A. Provide plumbing piping specialties as shown on the drawings and specified herein.

1.3 SHOCK ABSORBERS

- A. Provide shock absorbers on water supplies immediately adjacent to equipment wherein quick-closing valves are installed and as indicated on the drawings.

1.4 SUMMARY

- A. This section includes the following:
 - 1. Shock absorbers

PART 2 - PRODUCTS

2.1 SHOCK ABSORBERS

- A. Shock absorbers for general use shall be nested stainless steel bellows type contained within a sealed stainless steel chamber. Shock absorbers shall be sized in accordance with the manufacturer's recommendations.
- B. Manufacturer and Model
 - 1. Zurn Z-1700 Shocktrol
 - 2. Josam Series 75000 Water Hammer Arrestors
 - 3. J.R. Smith Series 5000 Hydrotrol

PART 3 - EXECUTION

3.1 SHOCK ABSORBERS

- A. Provide shutoff valves between each shock absorber and the piping served to permit removal of shock absorber while the system is under pressure.

END OF SECTION 22 1119

SECTION 22 1316 - SANITARY AND VENT PIPING

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 PIPING SYSTEM STANDARDS OF MATERIALS

- A. Each pipe length shall have the manufacturer's name cast, stamped, or rolled on.
- B. Each fitting shall have the manufacturer's symbol and pressure rating cast, stamped, or rolled on.

1.3 SUMMARY

- A. This section includes the following:
 - 1. Sanitary waste and vent piping – Interior
 - 2. Sanitary waste and vent piping – Below grade
 - 3. Installation and Testing

PART 2 – PRODUCTS

2.1 PIPING AND FITTINGS MATERIAL SCHEDULE

- A. Sanitary waste and vent systems shall be constructed of the following materials, subject to approval by authorities having jurisdiction.
 - 1. Sanitary Waste and Vent Piping– Interior
 - Pipe: Service weight no-hub Cast Iron – ASTM A74, ASTM A888, CISPI 301
 - Fittings: No-hub Cast Iron drainage – ASME B16.4, ASTM B16.12, ASTM A74, ASTM A888, CISPI 301
 - Joints: 4 inches and smaller - cast iron neoprene gasket with stainless steel coupling and two straps
 - Manufacturer: Tyler Pipe; Charlotte Pipe; Bibby-Ste-Croix
 - 2. Sanitary Waste and Vent Piping– Below Grade
 - Pipe: Service weight hub and spigot Cast Iron – ASTM A74, ASTM A888, CISPI 301
 - Fittings: Cast Iron hub and spigot – ASTM A74, ASTM A888, CISPI 301
 - Joints: Rubber compression gaskets – ASTM C564
 - Manufacturer: Tyler Pipe; Charlotte Pipe; Bibby-Ste-Croix

2.2 PLUMBING PIPING SYSTEM PRESSURE CLASSIFICATION

- A. Piping, fittings, and components, for the sanitary and vent piping systems shall be capable of withstanding the following:

Plumbing Piping System	Minimum Working Pressure
Sanitary Waste and Vent	10 foot head of water

PART 3 – EXECUTION

3.1 GENERAL

- A. Provide provision for expansion and contraction in the piping systems, to prevent undue stress or strain on piping, building anchor points, and connected equipment.
- B. Piping passing through roof construction shall be arranged to provide a minimum of 12 inch clearance from walls or other obstructions so as to permit proper flashing. Set pipe flashing fittings at a suitable level above the roof to permit proper termination of flashing.

3.2 INSTALLATION AND TESTING

A. Installation Procedures

- Sanitary piping 2-1/2 inches and smaller shall be sloped at a minimum pitch of 1/4 inch per foot. Sanitary piping 3 inches to 6 inches shall be sloped at a minimum pitch of 1/8 inch per foot. Connections to stacks or main drains shall be made in a manner that shall not permit backflow.
- Vent piping shall be arranged to drain any condensate back to drainage piping.
- Provide test tees in vertical risers as required to permit testing in sections.
- Pipe shall have the cutting burrs and sharp edges reamed out.
- When connecting to existing sanitary piping system, clean out piping from tie-in to next downstream cleanout.

B. System Testing

- The entire sanitary and vent piping system shall be subjected to testing in accordance with applicable codes. Plumbing contractor shall provide all equipment, material, labor and associated appurtenances necessary for drainage system testing.
- The sanitary and vent piping systems shall be provided with two separate tests. The first test shall occur during the installation and the final test shall occur after the plumbing fixtures have been set and their traps filled with water. The entire sanitary and vent piping system shall be submitted to the final test.

3. Sanitary and vent piping systems testing during construction shall be provided by utilizing water as the test medium.
 - a. Water Test
 - 1) A water test shall be applied to the sanitary and vent piping system either in its entirety or in sections. If applied to the entire system, all openings in the piping system shall be tightly closed, except the highest opening, and the system shall be filled to the point of overflow. If the system is tested in sections, each opening shall be tightly plugged except the highest openings of the section under test. The section shall be filled with no less than a 10 foot head of water.
 - 2) In testing successive sections, at least the upper 10 feet of the next preceding section shall be tested so that no joint or pipe in the building, except for the uppermost 10 feet of the system, shall have been submitted to a test of not less than a 10 foot head of water.
 - 3) The water shall be kept in the system, or in a portion under test, for at least 15 minutes before inspection starts.
4. Final Test.
 - a. The final test of the completed drainage and vent system shall be visual and in detail to determine compliance with the provisions of the Plumbing Code except that the systems shall be subject to a smoke test where necessary for cause.

END OF SECTION 22 1316

SECTION 22 1319 - SANITARY AND VENT PIPING SPECIALTIES

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 GENERAL

- A. Provide sanitary and vent piping specialties as shown on drawings and as specified herein.

1.3 CLEANOUTS

- A. Provide cleanouts as required by local codes and authorities, as shown on drawings, and as specified herein.

1.4 SUMMARY

- A. This section includes the following:
 - 1. Cleanouts

PART 2 - PRODUCTS

2.1 CLEANOUTS

- A. Cleanouts shall be full size of pipe up to 4 inches, and shall be 4 inches for larger sizes. Cleanouts on piping 6 inches and smaller shall be provided with a clearance of not less than 18 inches for rodding.
- B. Horizontal drains within a building shall be provided with cleanouts at every change of direction greater than 45 degrees.
- C. All urinals and lavatories shall have cleanouts located as indicated on the drawings.
- D. Manufacturer and Model

<u>Location</u>	<u>Zurn</u>	<u>J.R. Smith</u>	<u>Josam</u>
<u>Unfinished Areas</u>			
Walls	ZB-1441	4402-PB	58710-1
Floors	ZB-1402	SQ-4-1388	58360-2-96-2
<u>Finished Floors</u>			
Ceramic Tile	ZN-1400-TX	4020-PB-S	56010-2
<u>Finished Walls</u>			
Plaster	ZN-1446	4530-Y	58790
Tile	ZN-1446	4530-Y	58790

Exposed Piping
Vertical

ZN-1440

4400

58490

PART 3 – EXECUTION (not used)

END OF SECTION 22 1319

SECTION 22 4200 - COMMERCIAL PLUMBING FIXTURES AND TRIM

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 GENERAL

- A. Provided sink trap as specified herein.
- B. Provide sink supply pipes as specified herein.
- C. Provide plumbing fixtures as indicated on the drawings and specified herein.

1.3 SUMMARY

- A. This Section includes the following:
 - 1. Traps
 - 2. Supply Pipes
 - 3. Plumbing Fixtures
 - 4. Floor Drains

PART 2 – PRODUCTS

2.1 TRAPS

- A. For sinks with 1 ¼ inch drain openings that are not provided with traps, provide an adjustable chrome-plated P-trap. P-Traps shall be 1 ¼ inch x 1 ½ inch, 17 gauge tubing outlet with cleanout plug, wall flange, and slip joint inlet with Trap-Wrap.
 - 1. Manufacturer
 - a. McGuire
- B. For sinks with 1 ½ inch drain openings that are not provided with traps, provide an adjustable chrome-plated P-trap. P-Traps shall be 1 ½ inch x 1 ½ inch, 17 gauge tubing outlet with cleanout plug, wall flange, and slip joint inlet with Trap-Wrap.
 - 1. Manufacturer and Model
 - a. McGuire
- C. Exposed piping, fittings, escutcheons, valves, etc. shall be chrome-plated brass.

2.2 SUPPLY PIPES

- A. Supply pipes for sinks shall be 1/2 inch IPS x 3/8 inch O.D. angle valve with loose key handle, flexible tubing, cast brass escutcheon with set screw.
 - 1. Manufacturer
 - a. Chicago Faucet
- B. ADA Plumbing Fixtures
 - 1. Provide P-trap, hot water angle valves and supply tubing, and cold water angle valves and supply tubing, with insulation in accordance with the American with Disabilities Act (ADA). Equal to Truebro LavGuard 2 Undersink Piping Covers

2.3 PLUMBING FIXTURES

WC/1	Water Closet:	Kohler K-4330 "Kingston" syphon jet, wall hung, elongated bowl, 1-1/2" top spud; Sloan Optima 111-SMO battery powered, vandal resistant, sensor operated flush valve with courtesy flush over-ride button 1.6 GPF; K-4666C "Lustra" extra heavy solid plastic open front seat with stainless steel check hinge; Wade W-331 (horizontal) or W-331 (vertical) series carrier, single or double, right or left as required, with foot support.
WC/2	Water Closet: (ADA)	Same as "WC/1". See Architect's plans for handrails, elevations and partition spacing.)
WC/3	Water Closet: (ADA)	Kohler K-4368 "Highcliff" syphon jet, floor-mounted, extended lip bowl, 1-1/2" top spud, vitreous china, Sloan Optima 111-SMO battery powered, vandal resistant sensor operated flush valve with courtesy flush over-ride button 1.6 GPF; K-4666C "Lustra" extra heavy solid plastic open front seat with stainless steel check hinge; 52048 bolt caps.
U/1	Urinal:	Kohler K-4989-T "Freshman" vitreous china, wall hung, syphon jet with flushing rim, 2" outlet connection, 3/4" top spud with Sloan Optima 8186, vandal resistant, sensor operated flush valve with courtesy flush over-ride button (1.0 GPF); with vacuum breaker and flow regulator. JR Smith 0635 concealed wall support with floor plates and mounting studs.
U/2	Urinal: (ADA)	Same as "U/1". See Architect's plans for handrails, elevations and partition spacing.)
L/1	Lavatory:	Crane 1412-202H "Harwich" 20" x 18" - 4" wall mounted, center set vitreous china, front overflow, anti-splash rim, center basin, wall hanger, punched for JR Smith 0700 concealed arm carrier, Moen 8886 Metering, heavy duty, vandal resistant, cast brass, tipping handle faucet, 0.5 GPM, Chicago 327-X open grid chrome plated strainer, chrome plated 17 gauge chrome plated brass tailpiece and P-trap with bottom cleanout. Provide Brasscraft flexible, stainless steel, braided hose supplies with loose quarter key stops; cast brass trap with cleanout. Provide ASSE 1070 thermostatic mixing valve equal to Leonard 170-LF.
L/2	Lavatory: (ADA)	Same as "L/1". See Architect's plans for elevation and spacing.

ST/1	Shower Trim: (ADA)	Delta T13H333 single lever, pressure balanced ADA shower valve with volume control and adjustable temperature limit. Shower shall have 1.5 GPM hand held shower (55021), with grab bar (55083), 60" braided stainless steel flexible hose with Delta U7500 Quick Connect and diverting/volume control valve (4760) so that hose assembly and shower head may be easily disconnected and connected from the wall supply. Refer to architectural drawings for details regarding mounting heights for ADA compliance.
HB/1	Hose Bibb:	Chicago Faucet No.952-CP 1/2" sill faucet with 3/4" hose thread outlet, integral vacuum breaker, and removable tee handle, polished chrome-plated, with wall flange. Mount concealed up under lavatory.
FD-1	Floor Drain:	J. R. Smith 2010-A 2" floor drain with deep seal p-trap, polished nickel bronze strainer head and Proset trap guard.
A/1	Arrestor:	JR Smith 5020 Water Hammer Arrestor, bellows type with 1" inlet.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install plumbing fixtures in a secure, true, plumb and symmetrical manner according to manufacturers written instructions. Thoroughly clean each fixture after installation and leave in proper working order..
- B. Install water closet chair carriers and urinal wall supports in chases and in plumbing walls. Install lavatory concealed arms carriers for supporting lavatories from wall.
- C. When fixture trim is completed, adjust stops to provide proper flow through each valve or faucet. Each fixture shall be filled with water and checked for leaks and retarded drainage.
- D. Loose key or wheel handle stops, valves and similar devices shall be adjusted and balanced to provide first class operation of the various systems. Furnish loose keys and handles to owner clearly identified as to their service.
- E. Where any plumbing fixture comes in contact with the wall, seal with a non-shrink, mildew-resistant white caulking.
- F. Provide chrome plated escutcheons around all finished wall pipe penetrations including P-traps, flush valves and water supplies.
- G. Provide waterproofing of floor drains as required by local codes. Flashing material shall extend a minimum of 18 inches from the center of the floor drain in all directions.
- H. Installation of handicapped plumbing fixtures shall meet requirements of Americans with Disabilities Act.
- I. Provide final connection and install fixtures and equipment furnished by others.

END OF SECTION 22 4200

SECTION 23 3300 - DUCT ACCESSORIES

PART 1 - GENERAL

1.1 BALANCING DAMPERS

- A. Provide manual balancing dampers at each diffuser or register and as shown on the drawings. Dampers at diffusers and registers shall be placed as far as practical from the outlet. Construction of dampers shall conform to SMACNA Standards for the intended operating pressure range.

1.2 FLEXIBLE CONNECTIONS

- A. Fan and air supply units, both at inlet and discharge, shall be made with flexible material so as to prohibit the transfer of vibration from fans to connecting ductwork, without air leakage. The flexible material shall have sufficient slack so as to prevent tearing due to fan movement.

1.3 BACKDRAFT DAMPERS

- A. Provide backdraft dampers as shown on the drawings and specified herein.

PART 2 - PRODUCTS

2.1 BALANCING DAMPERS

- A. Balancing dampers for rectangular ductwork shall be opposed blade type, and shall be Ruskin Model MD35 Manual Balancing Damper with Locking Quadrant or equivalent for duct pressure ratings 2 inches w.g. or less, and Ruskin Model CD30AF1 with Locking Quadrant or equivalent for duct pressure ratings greater than 2 inches w.g..
- B. Balancing dampers for round ductwork shall be Ruskin Model MDRS25 Round Manual Balancing Damper with Locking Quadrant, or equivalent.

2.2 FLEXIBLE CONNECTIONS

- A. Flexible connections shall be a minimum of 8 inches long.
- B. Flexible connection shall be fabricated from approved flameproofed fabric in accordance with the applicable sections of the NFPA overall fire codes. Asbestos cloth is not permitted.

2.3 BACKDRAFT DAMPER

- A. Damper shall be pressure activated, vertical air flow with face linkage and an adjustable counter weight, with a range of positive pressure from .05 inches to .25 inches w.g.
- B. Frame shall be constructed of .090 inch thick extruded aluminum. Blades shall be formed from .025 inch aluminum. Blades shall have overlapping edges with extruded vinyl edge seals.
- C. Damper shall be Ruskin Model CBD2, or equivalent.

PART 3 - EXECUTION

3.1 BALANCING DAMPERS

- A. Provide balancing dampers where shown on drawings and provide one volume damper at every diffuser or transfer air grille. Volume damper shall be placed as far away from outlet as possible.
- B. When installing dampers in ducts to be insulated, provide raised bracket for damper quadrant with height equal to the insulation thickness.
- C. Locate dampers as far as possible from air outlet to minimize noise generation and transmission.
- D. Coordinate access to each damper and provide remote damper actuator if required to facilitate access.

3.2 FLEXIBLE CONNECTIONS

- A. Flexible connections shall be held in place with heavy metal bands securely attached to prevent air leakage at the connection points.
- B. Seal insulation at both ends to maintain insulation and vapor barrier continuity.

END OF SECTION 23 3300

SECTION 23 3416 - HVAC FANS

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. Powered roof ventilators.
 - 2. Ceiling fans

1.3 PERFORMANCE REQUIREMENTS

- A. Operating Limits: Classify according to AMCA 99.
- B. Catalog rated for 15 percent greater static pressure than specified at air volume,
- C. Selected so that the specified air volume is greater than that at the apex of the fan pressure volume curve.
- D. Selected to provide stable operation down to 85 percent of design volume operating at the required speed for the specified conditions.

1.4 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:
 - 1. Certified fan performance curves with system operating conditions indicated.
 - 2. Certified fan sound-power ratings.
 - 3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
 - 4. Material thickness and finishes, including color charts.
 - 5. Dampers, including housings, linkages, and operators.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Fans shall be AMCA certified for sound and air performance.
- B. Fans shall be provided complete with motors and drives. Belt drive fans shall be provided with belt guards meeting OSHA requirements. Belt guards shall allow speed measurement at both

fan and motor without removing guard. Each fan shall include an allowance for one pulley and belt change during balancing procedures.

- C. Provide appropriate weather covers for motors and belts where fans are exposed to weather.
- D. Fans shall be balanced statically and dynamically for maximum rated speed.
- E. Bearings shall be ball or roller anti-friction type with minimum L10 life of 160,000 hours.
- F. Drives shall be selected for a 1.5 service factor.

2.2 CENTRIFUGAL ROOF VENTILATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Acme Engineering & Mfg. Corp.
 - 2. Breidert Air Products.
 - 3. Broan Mfg. Co., Inc.
 - 4. Carnes Company HVAC.
 - 5. Greenheck.
 - 6. Loren Cook Company.
 - 7. Penn Ventilation.
- B. Description: Direct- or belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.
- C. Housing: Removable, spun-aluminum, dome top and outlet baffle square, one-piece, aluminum base with venturi inlet cone.
- D. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.
- E. Belt-Driven Drive Assembly: Resiliently mounted to housing, with the following features:
 - 1. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
 - 2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
 - 3. Pulleys: Cast-iron, adjustable-pitch motor pulley.
 - 4. Fan and motor isolated from exhaust airstream.
- F. Accessories:
 - 1. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
 - 2. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
 - 3. Dampers: Counterbalanced, backdraft dampers mounted in curb base; factory set to close when fan stops.
- G. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.
 - 1. Overall Height: 16 inches

2.3 CEILING-MOUNTING VENTILATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Breidert Air Products.
 - 2. Broan Mfg. Co., Inc.
 - 3. Carnes Company HVAC.
 - 4. Greenheck.
 - 5. Loren Cook Company.
 - 6. Penn Ventilation.
- B. Description: Centrifugal fans designed for installing in ceiling or wall or for concealed in-line applications.
- C. Housing: Steel, lined with acoustical insulation.
- D. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.
- E. Grille: Painted aluminum, louvered grille with flange on intake and thumbscrew attachment to fan housing.
- F. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.
- G. Accessories:
 - 1. Integral disconnect located on fan housing.
 - 2. Time-Delay Switch: Assembly with single-pole rocker switch, timer, and cover plate.
 - 3. Motion Sensor: Motion detector with adjustable shutoff timer.
 - 4. Isolation: Rubber-in-shear vibration isolators.
 - 5. Manufacturer's standard roof jack or wall cap, and transition fittings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install centrifugal fans level and plumb.
- B. Secure roof-mounting fans to roof curbs with cadmium-plated hardware. Secure roof curbs tight to existing structure.
- C. Ceiling Units: Support suspended units from structure using threaded steel rods and elastomeric hangers having a static deflection of 1 inch. Ensure vibration free operation.
- D. Install units with clearances for service and maintenance.

3.2 CONNECTIONS

- A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors.

- B. Install ducts adjacent to fans to allow service and maintenance.

3.3 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
 - 2. Verify that cleaning and adjusting are complete.
 - 3. Adjust belt tension.
 - 4. Adjust damper linkages for proper damper operation.
 - 5. Verify lubrication for bearings and other moving parts.
 - 6. Verify that manual dampers in connected ductwork systems are in fully open position.
 - 7. Remove and replace malfunctioning units and retest as specified above.
- B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION 23 3416

SECTION 23 3713 - DIFFUSERS, REGISTERS, AND GRILLES

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 ceiling- and wall-mounted diffusers, registers, and grilles.

1.3 GENERAL

- A. Provide diffusers, registers and grilles as scheduled on the drawings and specified herein. Refer to architectural reflected ceiling plans for exact locations of diffusers, registers and grilles. Make minor modifications to ductwork as required.
- B. Diffusers, registers and grilles shall be tested and rated in an ADC Certified Laboratory in accordance with ADC requirements.

PART 2 - PRODUCTS

2.1 DIFFUSERS, REGISTERS, AND GRILLES

- A. Diffusers, Registers, and Grilles shall be factory fabricated constructed of steel or aluminum and shall have fixed or adjustable air discharge pattern as indicated. Coordinate diffuser type with ceiling type.
- B. Each unit shall be provided with removable factory fabricated opposed blade, gang operated, volume regulator with accessible operator.
- C. See drawings for basis of design manufacturer, model and additional accessories.
- D. Approved manufacturers: Titus, Anemostat, Krueger, EH Price, Tuttle & Bailey.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

3.2 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 3713

SECTION 260500 - 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 Division 26 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	260500
2. Electrical Connections for Equipment	260507
3. Conductors and Cables	260519
4. Grounding	260526
5. Supporting Devices	260529
6. Conduit Raceway	260532
7. Electrical Boxes and Fittings	260533
8. Occupancy Sensors	260923
9. Lighting Control Equipment	260943
10. Wiring Devices	262726
11. Motor and Circuit Disconnects	262816
12. Motor Starters	262913
13. Demolition	264119
14. Interior and Exterior Building Lighting	265100
15. Exterior Area Lighting	265600
16. Telephone/Data Systems	271500
17. Fire Alarm and Detection System	283111

- 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 Division 26 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 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 Division 26, for material and installation requirements.
- D. Concrete Work:
 - 1. Provide forming, steel bar reinforcing, cast-in-place concrete, finishing and grouting as required for under ground 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 vaportight. 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. Irrigation controllers.

1.6 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.

1.7 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 which 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.

1.8 SUBMITTALS:

A. SHOP DRAWINGS AND PRODUCT DATA:

- 1. After the Contract is awarded but prior to manufacture or installation of any equipment, prepare complete Shop Drawings and Brochures for materials and equipment as required by each section of the specification. Submit 8 complete sets for review. All sets of shop drawing material shall be bound. 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 insure proper clearance for installation of equipment. Check all materials and equipment after arrival on the job site and verify compliance with the Contract Documents. A minimum period of two weeks, exclusive of transmittal time, will be required each time Shop Drawing and/or Brochure is submitted or resubmitted for review. This time period shall be considered by the Contractor when scheduling submittal data. If the shop drawings are rejected twice, the contractor shall reimburse the engineer the sum of \$200.00 for the third review and any additional reviews required.
- 2. Review of Shop Drawings and Brochures 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. Certifications shall be written or in the form of rubber stamp impressions as follows:

4. 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)

Signed_____.

Position_____ Date

5. Observe the following rules when submitting the Shop Drawings and Brochures.

- a. 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.
- b. 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.
- c. 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 which 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.

1.9 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., which 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 in which 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:

- 1. "CERTIFIED CORRECT (3/8" high letters)

(Name of General Contractor) _____

By _____ Date

(Name of Electrical Contractor) _____

By _____ Date

1.10 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 which 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.

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 which will ensure that no damage or service interruption will result from excavating and backfilling. Perform excavation in a manner which 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 subbases.
- 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 manner which will not interfere with or damage excavation or other work. Do not store under trees (within drip line).
- G. Retain excavated material which complies with requirements for backfill material. Dispose of excavated material which 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 (95 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.
- F. Refer to Section 260532 for additional requirements associated with backfill of Logan City trenching requirements.

3.7 ROOF PENETRATIONS:

- A. Where raceways penetrate roofing or similar structural area, coordinate with the Roofing Contractor and the Architect. Roof Jacks, flashing, etc. is by Division 7.

3.8 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 into which 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 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.

3.9 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 260500

SECTION 260507 - 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-26 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 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 which 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 260532, Conduit Raceways; Section 262726 Wiring Devices; and Section 260519 Wire and Cable for additional requirements. Provide final connections for equipment consistent with the following:
- B. 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.
- C. 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).

- D. 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, 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.
- 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 260519, Conductors, for identification of electrical power supply conductor terminations.

END OF SECTION 260507

SECTION 260519 - CONDUCTORS AND CABLES (600V AND BELOW)

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 conductors and cables specified herein.

1.2 DESCRIPTION OF WORK:

- A. Extent of electrical conductor and electrical cable work is indicated by drawings and schedules.
- B. Types of conductors and cables in this section include the following:
 - 1. Copper Conductors (600V)
- C. Applications for conductors and cables required for project include:
 - 1. Feeders
 - 2. Branch Circuits

1.3 QUALITY ASSURANCE:

- A. Comply with NEC as applicable to construction and installation of electrical conductors and cable. Comply with UL standards and provide electrical conductors and cables which have been UL-listed and labeled.
- B. Comply with applicable portions of NEMA/Insulated Cable Engineers Association standards pertaining to materials, construction and testing of conductors and cable.
- C. Comply with applicable portions of ANSI/ASTM and IEEE standards pertaining to construction of conductors and cable.

1.4 SUBMITTALS:

- A. FIELD TEST DATA:
 - 1. Submit megohmmeter test data for circuits under 600 volts.

PART 2 - PRODUCTS

2.1 COPPER 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. 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. Provide stranded conductors for #8 AWG and larger.

- B. 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.
- C. 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. MC Cable is not allowed as an acceptable conductor or cable material for installation.

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 to which pull wire 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 which 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 which is noncorrosive to cable sheath, self-extinguishing, and which will not support combustion. Construct tape of materials which 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. Provide Scotchcast 400 resin for water-tight connection on all exterior terminations subject to moisture.
- M. Do not exceed grouping of 3 circuits in any homerun to a panelboard in a single conduit.

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. Submit record in triplicate of megohmmeter readings to Architect/Engineer.
- B. Subsequent to wire and cable connections, energize circuitry and demonstrate functioning in accordance with requirements.

END OF SECTION 260519

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SECTION 260526 - 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. Grounding Electrodes
 - 2. Enclosures
 - 3. Systems
 - 4. Equipment
 - 5. 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 which 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. 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.
- D. CONNECTIONS TO PIPE: For cable to pipe, OZ/Gedney G-100B series or Thomas & Betts #390X series, or Burndy type GAR.
- E. 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.
- F. BONDING JUMPERS: OZ/Gedney Type BJ, or Thomas & Betts #3840 series, or Burndy type GG and type B braid.
- G. 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 grounding conductors for dimming systems in accordance with manufacturer's requirement.

3.2 GROUNDING ELECTRODES:

- A. GROUNDING ELECTRODE CONDUCTOR: Provide grounding electrode conductor

sized per NEC table 250-94 or as indicated.

- B. 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.
- C. 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.
- D. Provide bonding wire in all flexible conduit.

END OF SECTION 260526

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SECTION 260529 - 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 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 which 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 insure 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. RACEWAYS:

1. Support raceways which 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" & 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.

E. 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 Section 26.

END OF SECTION 260529

SECTION 260532 - CONDUIT RACEWAYS

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. 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 which have been UL-listed and labeled. Comply with NEC requirements as applicable to construction and installation of raceway systems.
- C. **SUBMITTALS:** 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. MC CABLE: Not acceptable.
 - G. 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.
 - H. ELECTRICAL METALLIC TUBING (EMT): FS WW-C-563 and ANSI C80.3.
 - I. 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.
 - J. FLEXIBLE METAL CONDUIT: FS WW-C-566, of the following type;
 - 1. Zinc-coated steel.
 - K. FLEXIBLE METAL CONDUIT FITTINGS: FS W-F-406, Type 1, Class 1, and Style A.
 - L. 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).
 - M. LIQUID-TIGHT FLEXIBLE METAL CONDUIT FITTINGS: FS W-F-406, Type 1, Class 3, Style G.
 - N. 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, which 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. 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 GRC or IMC. In suspended slabs, install in EMT. Encase non-metallic duct 1-1/4" and larger in concrete. See duct banks.
- 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. 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.
 - 3. Provide a minimum of 1 1/2" from nearest surface of the roof decking to raceway.
 - 4. 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.

5. Provide neutral and ground wire as specified elsewhere in documents.
 6. 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 which 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. Provide OZ cable supports in all vertical risers in accordance with NEC 300-19; type as required by application.
- L. Complete installation of electrical raceways before starting installation of cables/conductors within raceways.
- M. 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.
- N. 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 minimum of 4" below gravel sub-base. See detail on drawings. 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 which 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.

O. 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.

END OF SECTION 260532

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SECTION 260533 - 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 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. Conduit Bodies
 - 5. Bushings
 - 6. Locknuts
 - 7. Knockout Closures
 - 8. 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 which have been UL-listed and labeled.

1.4 SUBMITTALS: None required

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, which 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. MANUFACTURER:

1. Subject to compliance with requirements, provide floor boxes of one of the following:
 - a. Bell Electric/Square D Co.
 - b. Crouse-Hinds Co.
 - c. Harvey Hubbell, Inc.
 - d. Steel City/Midland-Ross Corp.

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 to which attached, 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 electrical connections for installed boxes.
9. Provide an approved fitting on each end of each conduit (regardless of voltage) whether in panel, box, etc. or in free air.

END OF SECTION 260533

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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 Ceiling Sensor
 - 3. 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 which 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.
- C. Manufacturer: Minimum [10] years experience in manufacture of lighting controls.
- D. Products: All electrical components and devices shall be listed and labeled as defined in NFPA 70, Article 100, by a testing agency and marked for intended use.
- E. Comply with NFPA 70

1.4 SUBMITTALS:

- A. PRODUCT DATA: Submit manufacturer's data on occupancy sensors, control modules, wiring diagrams, interconnection diagrams and any related accessories.
- B. Submit scaled drawings with lighting fixtures shown clearly marked by manufacturer showing proper product, location and orientation of each sensor.

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. Philips Controls
 - b. Leviton
 - c. Wattstopper-DT Series
 - d. Greengate ONW-D

B. 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 which 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 which 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. Philips Controls
 - b. Leviton
 - c. Wattstopper-DT Series
 - d. Greengate OAC – DT Series
- C. 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 be available in versions to accept 120, and 277 VAC line voltages.
 3. Output shall be 24VDC nominal, and shall be inherently safe, low voltage, limited power output (Class 2).
 4. Output shall supply 100mA current, in addition to current consumed internally to operate internal relay.
 5. Relay shall utilize normally open, silver alloy dry contacts, and shall be rated for a 20A ballast load at 120V and 277V.
 6. Relay function shall not require more than 5 mA control current to operate.
 7. 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.
 8. Control module shall be sized to fit inside a standard 4" x 4" junction box.
 9. 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.
 10. 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.
 11. Slave module shall be available for switching additional circuits. Slave module has same construction and specifications as control module except without power supply function.
 12. Subject to compliance with the above requirements, provide models of one of the following:
 - a. Philips Controls
 - b. Leviton
 - c. Wattstopper-BEP Series
 - d. Greengate SP20-MV 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. Provide 5 spare sensors for each type used on 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 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. Wall stations
 - 3. Room Controllers
 - 4. Occupancy sensors
 - 5. Daylight photosensor
- 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. Product Data: 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.
- B. Shop Drawings: Submit detailed drawings and documentation of lighting control components and interconnection including, but not necessarily limited to:
 - 1. Electronic controllers
 - 2. Control stations
 - 3. Photo sensors
 - 4. Occupancy sensors
 - 5. Remote Low Voltage enclosures and locations
 - 6. Network wiring details
 - 7. Input and output wiring details
 - 8. Lighting control panel load schedules
 - 9. Accurately scaled equipment layouts, wire/cable routing and connections to control wiring and electrical power feeders.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Manufacturer: Subject to compliance with requirements, provide lighting control equipment of one of the following;
 - 1. Douglas Lighting Controls
 - 2. Greengate Lighting Control
 - 3. Leviton Manufacturing Co. Inc. GreenMAX
 - 4. Lighting Control & Design
 - 5. Wattstopper

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. Astronomical clock with offsets
 8. Local control (from touchscreen and local switch)
 9. Digital switches
 10. Flash warning of impending off for occupants
 11. 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 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.
- 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 and enterprise software.
- H. Minimum lighting control performance required, unless local Energy Code is more stringent

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 of 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. 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.
 - 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. 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.
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 sensor with a translucent dome with a 180° field of view and respond in the range of 1,000-10,000 foot-candles. The sensor shall mount to a ½" KO or threaded conduit.
14. Wiring:
- a. Provide CAT6 cable between switches and controller to create a digital switch network.
 - b. Provide CAT6 cable between controller and other controllers via a RS-485 network. The RS-485 network shall support up to 250 controllers with a maximum distance of 4000 feet.
 - 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.
 - e. All low voltage wiring shall be color coded to match the relays, switches and sensors. Wire shall be UL listed as conforming to Class 2 or Class 2P wire requirements
15. Handheld Display Unit(HDU):
- a. Provide unit that is compatible with all available features of the specified system.
16. Optional Accessories: Provide the following accessories;
- 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. Modem: The control panel shall provide a serial communications port for external telecommunications. The modem shall utilize the Hayes compatibility standard and enable modem access as defined by Bell 212A and CCITT V-22 Protocol Standards.
- d. Automation Interface Module: 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.

17. Additional controls:

- a. Provide occupancy or vacancy sensors for any classroom, lab, training room, etc whether shown on the plans or not.. Spaces with multiple occupants or where line of sight may be obscured require ceiling or wall/corner mounted sensors with Manual On switches. Wall/corner sensors only to be used as approved by engineer.
- b. Rooms shall have controls that allow for independent control of each output. Rooms larger than 300 square feet shall support at least four (4) pre-set lighting scenes. Occupancy or vacancy sensors shall ensure all lighting in the space is turned Off when no occupancy.

18. Egress lighting control shall be integral to the system. The system shall provide an automatic control of egress lighting based upon room occupancy without programming. Systems that do not ensure that egress lighting is controlled with room occupancy shall not be acceptable.

B. Room Controllers:

- 1. The room controller shall provide the following functionality;
- 2. Provide interface with room occupancy sensor to provide lighting control and be programmable as either manual on/automatic off or automatic on/automatic off (automatic on shall not allow lighting to exceed 50% level). Provide interface with room wall stations to provide multi-level switching and/or variable dimming. Provide interface with daylight photosensors to provide daylighting controls of lighting fixture via multi-level variable dimming.
- 3. Provide with network interface to tie to building relay panel
- 4. 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.
- 5. Daylight photo 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.
- 6. 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. Where specified, the sensor shall have an internal additional isolated relay with NO, NC and common outputs for use with HVAC control, data logging and other control options.
- 7. Wall Stations: Provide low voltage momentary push-button switches up to 6 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). Wall station shall connect to the room controller via the room controller local network. Wall stations must allow for user interface that allows for raise/lower control of dimming of each load.

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 switches, relays, daylighting zones, groups of relays shall be completed by factory authorized technician, prior to final and training. Programming shall be done to meet code and meet owners programming expectations/schedules:
 - a. Owner must provide sign-off on system lighting programming.
- 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 COMMISSIONING:

- A. As specified in Article 1.11, 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 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. At the time of checkout and testing, the owner's representative shall be thoroughly instructed in the proper operation of the system.
- 3.5 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. As specified in Article 1.12, Paragraph C, Leviton Manufacturing provides 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.

3.6 WARRANTY:

- A. Manufacturer shall provide a two (2) year limited warranty on lighting control system. A ten (10) year limited warranty shall be provided on the lighting control relays.

3.7 AS-BUILT DRAWINGS:

- A. 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.
- B. Provide a CD to the owner containing the information specified below. The CD shall include all information required to allow the Owner to change the schedules themselves. The CD 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.

3.8 TRAINING:

- A. Provide four (4) hours of video taped 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 CD to the owner containing the information specified below. The CD shall include all information required to allow the Owner to change the schedules themselves. The CD 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

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SECTION 262726 - 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 which 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. Cord caps
 - 4. Cord connectors

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 which have been UL listed and labeled.

1.4 SUBMITTALS:

- A. PRODUCT DATA:
 - 1. Submit manufacturer's data on electrical wiring devices.

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>MFGR.</u>	<u>RECEPTACLE</u>	<u>SWITCHES</u>			
		<u>1-POLE</u>	<u>3-WAY</u>	<u>4-WAY</u>	<u>W-PILOT</u>
Hubbell	HBL5352	HBL 1221	HBL 1223	HBL1224	HBL1221-PL
Bryant	5352	1221	1223	1224	1221-PL
Pass Seymour	5352	20AC1	20AC3	20AC4	20AC1-RPL
Leviton	5362	1221	1223	1224	
Cooper	5352	1221	1273	1224	1221-PL

C. Provide devices in colors selected by Architect. Provide red devices on all emergency circuits.

D. TRANSIENT VOLTAGE SURGE SUPPRESSION (TVSS) RECEPTACLES:

1. Provide TVSS 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:

MANUFACTURER

<u>SPECIFICATION GRADE</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

2. 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 milliampere 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. 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 2095TRWXXX.
 - b. Hubbell GFTR20XX

G. 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

2.2 WIRING DEVICE ACCESSORIES:

A. WALL PLATES:

1. Provide stainless steel cover plates for all wiring devices. Provide stainless steel 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 which provide complete protection with the cord and cap inserted into the wiring device. Provide units which mount on either single or double gang devices.
2. Provide products of one of the following for roof mounted installations:
 - a. Intermatic WP1020 or WP1030
 - b. P&S WIUC10C or WIUC20c
3. Provide products of one of the following for all wall mounted installations:
 - a. Intermatic WP1000RC

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. Install wiring devices only in electrical boxes which are clean; free from excess building materials, dirt, and debris.
- D. Install blank plates on all boxes without devices.
- E. Delay installation of wiring devices until wiring work and painting is completed. Provide separate neutral conductor from panel to each GFI receptacle.
- F. Install GFI receptacles for all receptacles installed in restrooms, kitchens, outdoors or within six feet of any sink or when serving vending machines. Provide in elevator equipment rooms and pits.

3.2 PROTECTION OF WALL PLATES AND RECEPTACLES:

- A. At time of substantial completion, replace those items, which 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 262726

SECTION 262816 - 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 which have been UL listed and labeled. Comply with applicable requirements of NEMA Standards Pub. No. KS 1, and NEC.

1.4 SUBMITTALS:

- A. **PRODUCT DATA:** Submit manufacturer's data including specifications, installation and general recommendations, for each type of motor and circuit disconnect switch required.
- B. **SHOP DRAWINGS:** Submit dimensioned drawings of electrical motor and circuit disconnect switches which have rating of 100 amperes and larger.

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. Siemens Energy and Automation
 - 3. Square D Company

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 which 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 which 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 16180 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. 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.

END OF SECTION 262816

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 which have been UL-listed and labeled.

1.4 SUBMITTALS:

- A. PRODUCT DATA: Submit manufacturer's data on motor starters.
- B. SHOP DRAWINGS: Submit dimensioned drawings of motor starters showing accurately scaled equipment layouts.
- C. MOTOR VOLTAGE/CURRENT REPORT: 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.

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
MOTOR STARTERS

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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.

MOTOR STARTERS:

- C. **GENERAL:** Except as otherwise indicated, provide motor starters and ancillary components; of types, sizes, ratings and electrical characteristics indicated which comply with manufacturer's standard materials, design and construction in accordance with published information and as required for complete installations.
- D. **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.
- E. **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.
- F. **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.
- G. **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.
- H. **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.
- I. **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

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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 264119 – DEMOLITION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Special Provisions, Division 1 and Division-2A 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 demolition.

1.2 DESCRIPTION OF WORK:

- A. Extent of major items of demolition work is indicated by drawings. Other demolition work shall be performed as required to maintain system operation.
- B. The intent of the drawings is to indicate major items affected and not to show every device, outlet, fixture, etc. affected by demolition work.
- C. The drawings do not necessarily reflect as-built conditions. The contractor shall visit the jobsite prior to bidding to determine the overall scope of demolition work.
- D. Refer to sections of other Divisions for applicable requirements affecting demolition work.
- E. Refer to Section 260500 for requirements with regard to power outages affecting the operation of existing electrical systems.

1.3 QUALITY ASSURANCE:

A. NEC COMPLIANCE:

- 1. Comply with applicable portions of NEC as to methods used for demolition work.

PART 2 - PRODUCTS

2.1 GENERAL:

- A. Demolition work shall be laid out in advance to eliminate unnecessary cutting, drilling, channeling, etc. Where such cutting, drilling, or channeling becomes necessary, perform with care, use skilled mechanics of the trades involved. Repair damage to building and equipment. Cutting work of other Contractors shall be done only with the consent of that Contractor. Cutting of structural members shall not be permitted.

2.2 PATCHING AND REPAIR

- A. The Contractor is responsible for all demolition, patching and repair of all finished interior surfaces pertaining to the installation of this particular phase of work. All surfaces shall be finished (painted, etc.) to match the adjacent materials, finishes and colors.
- B. Hard surfaces: Whenever demolition or excavation is required for the installation of the electrical system, it shall be the responsibility of this contractor to make repairs and/or replacements of hard finish surfaces such as concrete, asphalt, roofing, etc.
- C. The method of patching and repair shall follow good construction practices and all finished surfaces shall match materials and finish wherein the demolition occurred.

2.3 EXISTING EQUIPMENT

- A. The following is a part of this project and all costs pertaining thereto shall be included in the base bid.
- B. The new electrical equipment and apparatus shall be coordinated and connected into the existing system as required. Auxiliary systems shall comply, unless otherwise specified.
- C. The existing electrical devices, conduit and/or equipment that for any reason obstructs construction shall be relocated. Provide conduit, wiring, junction boxes, etc. as required to extend existing circuits and systems to relocated devices or equipment.
- D. The new fixtures indicated for existing outlets shall be installed in accordance with the fixture specifications.
- E. When installing equipment, conduit, cable, devices, etc., in, or into the existing building, it shall be concealed.
- F. All existing electrical equipment and systems in portions of the building not being remodeled shall be kept operational, in service and in working condition throughout the entire construction period. Restore any circuits and systems interrupted. Provide temporary panels, temporary wiring and conduit, etc. as required.
- G. Maintain circuit integrity and continuity of all existing circuits and systems that interfere with or are interrupted by remodel work unless those circuits are to be abandoned completely. Maintain all circuits and systems in operation during construction. Provide temporary panels, temporary wiring and conduit, etc. as required.
- H. Existing raceways may be used where possible in place, except as noted. All circuits, conduit and wire that are not used in the remodeled area shall be removed back to the panelboard, where it shall be labeled a spare with circuit number indicated. Re-used raceway shall meet all requirements for new installations.
- I. The existing light fixtures which are not used in the remodeled area shall be carefully removed, and properly disposed of. Those fixtures indicated for re-use shall be thoroughly cleaned, repaired as required, relamped and installed as indicated.
- J. Obtain permission from the Architect and Owner's representative before penetrating any ceiling, floor, and wall surfaces.
- K. Any and all equipment having electrical connections that require disconnecting and reconnection at the same or another location throughout the course of construction shall be included as part of this contract.

END OF SECTION 264119

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. Comply with NEC 410-65C for all recessed incandescent light fixtures. Provide lighting fixtures which have been UL-listed and labeled.

1.4 SUBMITTALS:

A. PRODUCT DATA:

- 1. Submit manufacturer's data on interior and exterior building lighting fixtures.

B. SHOP DRAWINGS:

- 1. Submit dimensioned drawings of lighting fixtures. Submit fixture shop drawings in booklet form with separate sheet for each fixture, assembled in luminaire "type" alphabetical order, with proposed fixture and accessories clearly indicated on each sheet. Submit all available 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. Submit ballast manufacturer cut sheets. Submit a list of all lamps used on all projects.

PART 2 – PRODUCTS

2.1 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,

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.
2. Comply with manufacturer's written recommendations for all lamp ballast combinations.

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.
2. Provide LED luminaires which are tested in accordance with IES LM-79, diodes tested in accordance with IES LM-80, R9=20, CRI=80 and L70 (6K) = 50,000 hours (IES TM-21). Provide with 0-10V dimming drivers as standard.
3. 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. Warranty shall include an allowance for nominal replacement labor and replacement of defective product.

D. LUMINAIRE FUSING:

1. Provided in-line fusing for all luminaires. Provide GLR fuses and HLR -in-line fuse holders for each luminaire. Size fuses per manufacturer's recommendation.

E. DIFFUSERS:

1. Where plastic diffusers are specified, provide 100 percent virgin acrylic compound; minimum thickness, .125 inches.

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 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. Provide each lay-in light fixture with at least 36" (Not to exceed 72") of 3/8" steel flexible conduit.
- E. Coordinate lighting in mechanical room with duct and equipment locations.
- F. Provide gypsum board protection as required, (acceptable to fire official having jurisdiction) to ensure fire rating of each ceiling in which fixtures are installed.
- G. COORDINATION MEETINGS:
 1. Meet at least twice with the 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.
 2. 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 lighting fixtures which 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 265600 - 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 which 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. **PRODUCT DATA:** 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.

PART 2 - PRODUCTS

2.1 MANUFACTURER: Subject to compliance with requirements, provide products as scheduled on drawings.

- A. **FUSES:** Provide (3) spare fuses for each type and size used.
- B. **CONCRETE:** 3000 psi Class.

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. Grout the space between the pole base plate and the concrete base and provide a weep hole in the grout. Provide a base cover to conceal the bolts and the entire grout line, of the same material and color as the pole.
- 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.
- H. Provide Bussman HEB fuseholder (or Littelfuse LEB-XX-S) with "breakaway" receptacles in all conductors running to the top of each pole. Locate fuseholder at hand hole or in base junction box as applicable. Provide KTK fuses in each phase conductor, sized 1.5 times maximum full load current of ballasts served by each conductor. Do not exceed rating of circuit overcurrent protective device. Provide fuse blanks in neutral conductors. Make up all other splices in pole or pole base using Scotchcast 400 Resin for watertight connection.

3.2 GROUNDING:

- A. Provide equipment grounding connections for each lighting unit installation.

END OF SECTION 265600

SECTION 27 1500 - TELEPHONE/DATA SYSTEMS

PART 1 – GENERAL

1.1 SCOPE OF DOCUMENT:

- A. The following are project specifications to which all cabling systems must adhere. These specifications apply to all installers (hereinafter referred to as “the Contractor”) for all sites, which 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 Ogden School District.
- 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-26 Basic Materials and Methods sections apply to work specified in this section.

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 patch panels, cables, raceway, outlet boxes, device plates, 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, 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 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.
- 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 conduit from telecommunications outlet/connector to accessible

ceiling space, then utilize non-continuous cable support devices to cable tray or termination rack.

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. **PROVIDE PROOF OF RCDD CERTIFICATION IMMEDIATELY UPON JOB AWARD.**
 2. BICSI Certified Installers or equivalent.
 3. Possess those licenses/permits required to perform telecommunications installations in the specified jurisdiction.
 4. 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.
 5. 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.
 6. Personnel trained in the installation of pathways and support for housing horizontal and backbone cabling.
 7. 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.
 8. 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 engineers 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.

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 which 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-J-STD-607-A - 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, 12th 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 - 2008 National Electrical Code, revision, or most recent revision at the time of installation.
 13. ANSI/IEEE C-2 - 2007 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. Provide patch panels, cables, raceway, outlet boxes and device plates to match the existing materials and maintain the solution in place.

1.8 SUBMITTALS:

- A. Provide electronic submittals in Adobe PDF format within one file.
- B. Provide submittals for all patch panels, devices, cabling, firestopping solutions, 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.
- C. 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.
- D. For any unspecified components, Contractor shall submit manufacturer's data and installation details for all devices, plates, cables, termination blocks, patch cords, line suppression blocks, wire management, labels, and similar equipment.
- E. Provide color samples of all available standard color faceplates to architect.
- F. Provide proposed labeling scheme for approval by owner/engineer.

- G. Provide results of all copper and fiber optic cable tests.

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 4-11/16" x 2-1/8" deep square outlet box at each outlet location with single gang plaster or tile ring. Provide wall board adapters as necessary.
- 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 Category 6 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 connecting into all existing 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.
- B. Provide the following, see specifications for each item in this document:
 - a. Angled Copper Patch Panels (match existing):
 - i. Provide modular flush mount angled patch panels of required number and size to accommodate shown telecommunications outlets on plans. (No horizontal cable managers are required)
 - 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 6 or higher applications.
 - iv. Shall accommodate 8-Pin 8-Contact (8P8C) ports.
 - v. Mount to standard EIA 19" rack.
 - vi. Each patch panel shall include mounted behind it one "towel rack" style cable support bar for each 24 connections to which the Contractor shall dress cables using hook and loop type cable ties.
 - c. Vertical & Horizontal Cable Managers:
 - i. Provide a vertical and horizontal cable management panels as required to extend the existing capabilities.

2.3 CABLING DISTRIBUTION SYSTEMS AND MISCELLANEOUS EQUIPMENT

- A. General:
 - 1. Provide plenum rated cable if required, cabling must be appropriate for the environment in which it is installed. 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 cabling rated for the environment in which it is installed (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.

B. Horizontal Cabling Distribution System – Balanced Twisted Pair

1. General:

- a. Provide appropriate number of Category 6 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 6 UTP, minimum compliant, 4-Pair 100Ω Balanced Twisted Pair Cable to all locations shown on plans.
- b. Provide cabling rated for the environment in which it is installed (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.
- d. Horizontal cable shall be blue.
- e. Approved Equipment: See approved manufacturers list.

3. Patch and Work Area Cables::

- a. Provide (1) 7 foot long Cat 6 patch cable for each workstation and (1) 5 foot or 7 foot Cat 6 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.
- b. 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.
- c. 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.
- d. Patch cord and work area cables shall be blue.
- e. Provide (1) 5 foot, 2-strand optical fiber patch cable for each patch panel. The cable shall be provided by the same manufacturer and meets the same performance standards as the backbone optical fiber.

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. Blank off all unused ports.
- iii. Color: Standard color as selected by owner/architect.
- b. 8P8C Flat Connector:
 - i. Provide Category 6/Class E eight-position eight-contact (8P8C) jack, The termination cap shall be color coded for T568A and T568B wiring schemes.
 - ii. Be a Category 6/Class E eight-position jack module that terminates on unshielded twisted 4 pair, 22 – 26 AWG, 100 ohm cable utilizing a 110 punch down solution. Maintain cable pair geometry and minimize untwist while minimizing stress on critical circuit-board components.
 - iii. Color: Standard color as selected by owner/architect.

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. Arrangements to remove any major obstructions not identified on plans need to be determined at that time with the Engineer.
 - 2. Conduits:
 - a. For any interior/exterior conduit 2" and larger, utilize [Maxcell Fabric Innerduct](#).

<u>Conduit Size</u>	<u>MaxCell Size</u>
2"	(1) Pack of MaxCell 2" 3-cell
3"	(2) Packs of Maxcell 3" 3-cell
4" or greater	(3) Packs of MaxCell 3" 3-cell

- i. Include all necessary accessory parts and equipment for installation.
 - ii. Provide riser or plenum rated product to match environmental requirements.
 - iii. Contact MaxCell at 1-888-387-3828 for training on use of product.
 - b. 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.

- c. Conduit runs shall not have continuous sections longer than 100 feet without a pull box and may only be filled to 35% capacity.
 - d. Ream all conduit ends and fit with an insulated throat nylon bushing with non-indenter type malleable steel fittings to eliminate sharp edges.
 - e. 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.
 - f. 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.
 - g. Terminate conduits that protrude through the structural floor 1" to 3" above the surface within an EF/ER/TR.
 - h. After installation, conduits shall be clean, dry, unobstructed, capped for protection, labeled for identification, reamed and fitted with bushings.
 - i. A 200lb pull cord (nylon, 1/8" minimum) shall be installed in any empty conduit.
 - j. When the number of conduits requires more than one row, restrict the number of rows to two wherever practicable.
3. 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 which 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. [Panduit J-Pro](#)
 - ii. [Cooper](#)
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 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. Backbone cables shall be installed separately from horizontal distribution cables. All backbone cables will be run in orange innerduct. Provide plenum rated innerduct if required, innerduct must be appropriate for the environment in which it is installed.
3. 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.
4. 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.
5. 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.
6. Provide a minimum 10' service loop in each EF/ER/TR/TE.
7. Provide a minimum 2' service loop at each stub-up or at each transition from conduit to cable tray.
8. Provide a minimum 6'-10' service loop in the ceiling before the conduit travels down the wall and terminates into the communications junction 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.
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.

D. Grounding System:

1. All grounding and bonding shall be done according to ANSI J-STD-607-A, TIA 942, and NEC.
2. 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.
3. 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.
4. 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.
5. 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. $\leq 25'$ - #4
 - b. $\leq 50'$ - #1
 - c. $\leq 75'$ - #2/0
 - d. $\geq 75'$ - #3/0

E. Firestopping:

1. Provide firestop 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. Take picture of both sides of the firestopping seal and include in O&M documentation of all firestopped locations. Provide drawing correlating photographs to actual locations in building.
4. All penetrations through fire rated building structures (walls and floors) shall be sealed with an appropriate Firestop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating item i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall be properly firestopped.
5. Firestop systems shall be UL Classified to ASTM E8124 (UL 1479). A drawing showing the proposed firestop system shall be provided to the Engineer prior to installing the Firestop system(s).

6. Firestopping within conduits and sleeves shall be re-enterable. Firestopping outside and around annular space of sleeves and conduits at wall penetrations shall dry to a hard consistency. Mineral wool or other cavity stuffing shall be utilized as noted in the firestop system approved for this project.
 7. Utilize firestop pass-through type devices for medium to large penetrations into fire walls/floors. Similar to [STI Series SSB](#).
- F. 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 labels are not allowed.
- D. Provide laminated plans (minimum size 11x17) of all telecommunications as-built plans (including riser diagrams) in each and every EF, ER, and TR.

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 by a self-adhesive label 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, which 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 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.
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.

B. Copper Cable

1. Utilize Level IIIe 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. Far End Crosstalk (FEXT)
 - f. Attenuation to Crosstalk Ratio Far End (ACRF)
 - g. Attenuation/Crosstalk Ratio (ACR)
 - h. Return Loss

- i. Propagation Delay
- j. Delay Skew

3. All channels that fail testing parameters will be replaced at the Contractor's expense until all channels pass the performance parameters.

- C. Owner reserves the right to hire an independent testing company to spot check the test results. If the results vary more than 10% from the results provided by the Contractor, the Contractor will be required to prove his results are correct or retest the entire system.

5.2 WARRANTY:

- A. Register installation with cable/connectivity manufacturer.
- B. Provide and submit all test results to owner, engineer, and manufacturer and meet all other manufacturer requirements in order to provide minimum 20 year extended product link warranty for complete cabling/connectivity installation, including all copper and optical fiber utilized on the entire channel. The channel warranty shall be provided by the connectivity manufacturer. Include replacement material and installation for any defective product.

5.3 OPERATING AND MAINTENANCE MANUALS:

- A. Operating and maintenance manuals shall be submitted prior to testing of the system. A total of (4) hard copy O&M manuals and an Adobe PDF of the entire O&M manual shall be delivered to the Owner. Manuals shall include all service, installation, programming, and warranty, including test results for each cable.

5.4 TRAINING:

- A. Provide four hours training on the operation and installation of the structured cabling system at job site, at no cost to owner.

5.5 RECORD DRAWINGS:

- A. The Owner shall provide electronic (DWG) format of telephone/data system drawings on which 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.
- B. 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.

END OF SECTION 27 1500

SECTION 283111 - 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. Extent of fire alarm and detection systems work is indicated by drawings, schedules and as specified herein.
- B. 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.
- C. Comply with applicable provisions of current NFPA Standards 72A for Local Protective Signaling Systems, 72B Auxiliary Protective Signaling Systems, 72C Remote Station Protective Signaling Systems (as applicable), local building codes, and meet requirements of local authorities having jurisdiction.

1.3 SUBMITTALS:

- A. **PRODUCT DATA:** 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.
- B. **SHOP DRAWINGS:** 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.
- C. **CERTIFICATION:** 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.
- D. Provide to the Fire Marshall's office the following:
 - 1. A complete set of shop drawings indicating:
 - a. Location of all alarm-initiating and alarm-signaling devices.
 - b. Point-to-point wiring diagrams for all alarm-initiating and alarm-signaling devices.
 - 2. Wiring diagrams for:
 - a. Alarm control panels.
 - b. Auxiliary function relays and solenoids.
 - c. Remote signaling equipment.
 - d. Standby battery calculations, including voltage drop calculation.

3. A complete equipment list identifying:
 - a. Type
 - b. Model
 - c. Manufacturer
 - d. Manufacturer catalog data sheets
 - e. UL Listing and/or FM approval showing compatibility of device with Fire Alarm Control Panel (FACP)
 4. A complete zone list identifying all:
 - a. Alarm-initiating and alarm-signaling devices.
 - b. Remote signaling and auxiliary function zones.
 - c. Specific devices associated with each zone.
- E. Submit to State and Local Fire Marshall, a complete Certificate of Compliance

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. MANUFACTURER: Fire alarm work is expected to be extensions, alterations and deletions to the existing system. Coordinate all requirements with the representative of the system and as required by the Fire Marshal.

2.2 FIRE ALARM AND DETECTION SYSTEMS:

- A. SYSTEM OPERATION: Maintain the 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:
- B. 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.
- C. Selectively activate and/or deactivate fan units as required.
- D. Release all magnetic door holders upon activation of an alarm from any device by use of a master relay in the control panel.
- E. Provide supervised circuits for the following:
1. Close dampers upon activation of an alarm from any device through the HVAC interface relays.
 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.
- F. 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 BFSK or pulsed

single round fast 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.

- G. Provide external alarm horns sufficient to be heard in all parking areas.
- H. 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 21. Review final fire sprinkler drawings and coordinate for panel, flow and tamper switch locations.
- I. 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.

2.3 SCOPE OF THE WORK:

- A. Provide new addressable devices that match the existing fire alarm system.
- B. Provide all new fire alarm devices as required to keep the system operational.
- 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 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 unducted 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.
- E. All initiating devices connected to the fire alarm control panel shall be analog addressable.
- F. 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.

2.4 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.

2.5 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.

2.6 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.

2.7 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.

2.8 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).

2.9 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.

2.10 AUDIOVISUAL ALARM HORNS:

- A. Provide audio-visual alarm horns with the following features:
 - 1. Die cast or stamped steel construction, finished in red enamel, suitable for indoor or outdoor application.
 - 2. Capable of 90 db (UL rating) sound level at 10 feet.
 - 3. Flush mounted
 - 4. Integrally mounted flashing light unit, with Lexan lens with block letters "FIRE", and minimum flash rate of ONE per second, and 110 candela minimum.
 - 5. Electrically compatible with system requirements.

6. Horns shall sound the temporal pattern (code 3) until silenced.
7. Audiovisual alarm horns shall have the ability to silence horns while maintaining the strobe flash, until reset.
8. Mechanical horn mechanism only, electronic horns are not acceptable.
9. Maximum 24 horns per circuit, maximum 8 strobes per circuit.

- B. Strobes shall be synchronized when there are three or more within sight and less than 55 feet of viewer.

2.11 STROBES :

- A. Provide strobe with flashing light unit, with Lexan lens with block letters "FIRE", and minimum flash rate of ONE per second, and high intensity 110 candela minimum. Strobes shall be synchronized when there are three or more within sight and less than 55 feet of viewer.

2.12 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).

2.13 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.

2.14 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.

2.15 SUPPLEMENTAL NOTIFICATION CIRCUITS (FCI SNAC-4):

- A. Provide supplementary notification appliance circuit panel(s) as required. The 'SNAC' 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.

2.16 DOOR HOLDER POWER SUPPLY:

- A. Door holders shall be powered by a power supply separate from the fire alarm system power supply. The power supply shall have its own battery back-up capable of holding all doors for a minimum of one hour on the loss of 120vac supply power.

2.17 BATTERIES/POWER SUPPLIES:

- A. Provide additional standby batteries as required to operate the 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% 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 16 Basic Materials and Methods section, "Raceways", "Wires and Cables", and "Electrical Boxes and Fittings", and in accordance with other sections, as applicable.
- 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. 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.
- G. Refer to NFPA for spacing and exact placement of fire alarm devices.

PART 4 - FINAL ACCEPTANCE

4.1 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.

4.2 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.
- B. The supervisory circuitry of the initiating and indicating circuits shall also be verified.
- C. Provide printout demonstrating successful performance of all devices.

4.3 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

PART 5 - AS BUILT DRAWINGS AND OPERATION AND MAINTENANCE MANUALS:

5.1 AS BUILT DRAWINGS:

- A. 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.
- B. 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).
- C. Provide a CD to the Owner containing the information specified below. The CD shall include all information required to allow the Owner to change the fire alarm program themselves. The CD 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.
 5. Tutorial file on complete programming of fire alarm system.

END OF SECTION 283111

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SECTION 310700 GENERAL SITE CONSTRUCTION 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 PREPARATION

- A. Site Verification Of Conditions
 - 1. 48 hours minimum prior to performing any work on site, contact Blue Stakes to arrange for utility location services.
 - 2. Perform minor, investigative excavations to verify location of various existing 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 investigative excavating 5 days minimum in advance of performing any excavation or underground work.
 - 4. Upon discovery of conflicts or problems with existing facilities, notify Architect by phone or fax within 24 hours. Follow telephone or fax notification with letter and diagrams indicating conflict or problem and sufficient measurements and details to evaluate problem.
 - 5. Notify Owner of utilities a minimum of 48 hours prior to an work taking place.

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. Protect site from fire caused by welding, cutting, smoking, or other sources of ignition.
- 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.
- C. Fees
 - 1. Contractor shall be responsible for all off site street cut fees, encroachment permit fees, and bonding associated with the construction of the proposed facility.

3.3 REPAIR / RESTORATION

- A. Adjust existing covers, boxes, and vaults to grade.
- B. Replace broken or damaged covers, boxes, and vaults.
- C. Independently confirm size, location, and number of covers, boxes, and vaults which require adjustment.

3.4 FIELD QUALITY CONTROL

- A. Notify Architect 48 hours prior to performing excavation or fill work.
- B. If work has been interrupted by weather, scheduling, or other reason, notify Architect 24 hours minimum prior to intended resumption of grading or compacting.
- C. 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 310700

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 concrete, asphalt and fencing as indicated on demolition plan.
 - 2. Removing above- and below-grade site improvements.
 - 3. 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 "Structure Demolition" for demolition of structures, and site improvements.
 - 3. Division 31 Section "Earth Moving" for soil materials, excavating, backfilling, and site grading.

1.3 MATERIAL OWNERSHIP

- A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.4 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.

1.5 QUALITY ASSURANCE

- A. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 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: Contractor is to notify and pay for 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. 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 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.

3.5 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 311000

SECTION 312000 - EARTH MOVING

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.
- B. Refer to the Geotechnical Report titled for additional grading requirements. There is not a current geotechnical report available.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Preparing sub-grades for retaining walls, stairs and landscaping.
 - 2. Excavating and backfilling trenches for buried electrical utilities and pits for buried utility structures.
- B. Related Sections include the following:
 - 1. Division 01 Section Construction Progress Documentation and Photographic Documentation for recording pre-excavation and earthwork progress.
 - 2. Division 01 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities.
 - 3. Divisions 26 and 27 Sections for installing underground electrical utilities and buried electrical structures.
 - 4. Division 31 Section "Site Clearing" for temporary erosion and sedimentation control measures, site stripping, grubbing, stripping and stockpiling topsoil, and removal of above-grade and below-grade improvements and utilities.
 - 5. Division 32 Section for finish grading, including placing retaining walls and concrete for stairs and mow strip.
 - 6. Division 33 Section for installing underground utilities.

1.3 UNIT PRICES

- A. Unit prices for earthwork are included in Division 01 Section "Unit Prices."
- B. Quantity allowances for earthwork are included in Division 01 Section "Allowances."

1.4 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 and post tension concrete tennis courts..
- 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: 1-1/2-inch minus washed gravel or crushed stone course around perforated collector pipe.
- F. Drain Rock: Clean washed gravel, 3/4-inch minis placed on top of geofabric, PVC liner and compacted road base and under crusher course. This part of drainage layer that removes water from “future” artificial turf.
- G. 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 unit prices and 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.
- H. Fill: Soil materials used to raise existing grades.
- I. Structures: Slabs, curbs, 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.
- 1.5 SUBMITTALS
- A. Product Data: For the following:

1. Each type of plastic warning tape.
 2. Controlled low-strength material, including design mixture.
- 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 D698 or ASTM D1557 for each on-site and borrow soil material proposed for fill and backfill.
- C. Blasting Plan: Not Allowed
- D. Pre-excavation 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.

1.6 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.
- B. Pre-excavation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7 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.

- B. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM or AASHTO M 145 Soil Classification Groups A-1, A-2-4, A-2-5, and A-3, 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. Native rock crushed to meet the above requirements and free from significant porosity may also be used as satisfactory soils.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487 or A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145, 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. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- E. Aggregate Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed concrete and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-inch sieve and not more than 15 percent passing a No. 200 sieve. Sand Equivalent of no less than 35.
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve. (Cannot be straight sand).
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 3/4-inch sieve and not more than 8 percent passing a No. 200 sieve.
- H. Drainage Course (around perforated pipe): Narrowly graded mixture of washed or 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.

2.2 CONTROLLED LOW-STRENGTH MATERIAL

- A. Controlled Low-Strength Material: Low-density, self-compacting, flowable concrete material as follows:
 - 1. Portland Cement: ASTM C 150, Type II.
 - 2. Fly Ash: ASTM C 618, Class C or F.
 - 3. Normal-Weight Aggregate: ASTM C 33, 3/4-inch to 3/8-inch nominal maximum aggregate size.
 - 4. Foaming Agent: ASTM C 869.
 - 5. Water: ASTM C 94/C 94M.
 - 6. Air-Entraining Admixture: ASTM C 260.
- B. Produce low-density, controlled low-strength material with the following physical properties:

1. As-Cast Unit Weight: 30 to 36 lb/cu. ft. at point of placement, when tested according to ASTM C 138/C 138M.
2. Compressive Strength: 80 psi , when tested according to ASTM C 495.

2.3 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:
- B. 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 when required by utility purveyor:
 1. Red: Electric.
 2. Yellow: Gas, oil, steam, and dangerous materials.
 3. Orange: Telephone and other communications.
 4. Blue: Water systems.
 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 31 Section "Site Clearing."
- C. Protect and maintain erosion and sedimentation controls, which are specified in Division 31 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. 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.
 - 2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES – Not Allowed

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.
 - 2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
 - a. 24 inches outside of concrete forms other than at footings.
 - b. 12 inches outside of concrete forms at footings.
 - c. 6 inches outside of minimum required dimensions of concrete cast against grade.
 - d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
 - e. 6 inches beneath bottom of concrete slabs on grade.
 - f. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

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.
 - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 - 2. Excavation for Underground Basins, Vaults 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.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
 - 1. 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 and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
 - 1. For pipes and conduit less than 6 inches in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
 - 2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
 - 3. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

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.
 - 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 or vehicle with similar unit axle weight.
 - 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 unit prices and changes in the Work.
- 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.

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.
 - 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. Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 03 Section "Cast-in-Place Concrete."
- D. Provide 4-inch- thick, concrete-base slab support for piping or conduit less than 12 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase.
- E. Place and compact initial backfill of subbase material or satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the utility pipe or conduit.
 - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- F. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the utility pipe or conduit.
- G. Backfill voids with satisfactory soil while installing and removing shoring and bracing.
- H. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- I. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.
- J. 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 walks and pavements, use satisfactory soil material.
 - 2. Under steps and ramps, use engineered fill.
 - 3. Under footings and foundations, use engineered fill.
- 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 12-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. Reduce loose depths as needed to achieve required compactions.
- 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 698 or ASTM D 1557:
 1. Paved Areas: Compact top 12" of subgrade and each layer of backfill or fill material at 95% maximum dry density for cohesive material or 92% relative dry density for cohesionless material. Scarify and moisture condition to within 2% of optimum moisture and recompact subgrade.
 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. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent if in landscaping areas or 95 percent if under structures, pavements, or walks.

3.16 GRADING

- A. General: Uniformly laser grade areas within contract limits under this section, including adjacent transition areas, free of irregular surface changes. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated, or between such points and existing grades.
 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. Walks: Plus or minus 1 inch
 2. Pavements: Plus or minus 1/2 inch
- C. Finish surfaces free from irregular surface changes, and as follows:
 1. Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 1/4" above or below required subgrade elevation.

2. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than 1/4" above or below required subgrade elevation. Provide final grades within a tolerance of 1/4" when tested with a 10' straightedge.
3. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

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 and post tension concrete..
 2. Shape subbase and base course to required crown elevations and cross-slope grades.
 3. Place subbase and base course 6 inches or less in compacted thickness in a single layer.
 4. 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.
 5. 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 698 or ASTM D 1557.

3.18 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. 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 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. 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.
- D. 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.

3.19 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.

3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.
- B. 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 312000

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SECTION 315000 - EXCAVATION SUPPORT AND PROTECTION

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 temporary excavation support and protection systems.
- B. Related Sections:
 - 1. Division 01 Section "Construction Progress Documentation and Photographic Documentation" for recording preexisting conditions and excavation support and protection system progress.
 - 2. Division 01 Section "Temporary Facilities and Controls" for temporary utilities and support facilities.
 - 3. Division 31 Section "Dewatering" for dewatering system for excavations.

1.3 PERFORMANCE REQUIREMENTS

- A. Design, furnish, install, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting soil and hydrostatic pressure and superimposed and construction loads, as needed.
 - 1. Delegated Design: Design excavation support and protection system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
 - 2. Prevent surface water from entering excavations by grading, dikes, or other means.
 - 3. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.
 - 4. Monitor vibrations, settlements, and movements.

1.4 SUBMITTALS

- A. Shop Drawings: For excavation support and protection system.
- B. Delegated-Design Submittal: For excavation support and protection system indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

- C. Coordinate first paragraph below with qualification requirements in Division 01 Section "Quality Requirements" Qualification Data: For qualified professional engineer.
- D. Other Informational Submittals:
 - 1. Photographs or Videotape: Show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by the absence of, the installation of, or the performance of excavation support and protection systems. Submit before Work begins.
 - 2. Record Drawings: Identifying and locating capped utilities and other subsurface structural, electrical, or mechanical conditions.
 - a. Note locations and capping depth of wells and well points.

1.5 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to excavation support and protection system including, but not limited to, the following:
 - a. Existing utilities and subsurface conditions.
 - b. Proposed excavations.
 - c. Proposed equipment.
 - d. Monitoring of excavation support and protection system.
 - e. Working area location and stability.
 - f. Coordination with waterproofing.
 - g. Abandonment or removal of excavation support and protection system.

1.6 PROJECT CONDITIONS

- A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:
 - 1. Notify Architect no fewer than two days in advance of proposed interruption of utility.
 - 2. Do not proceed with interruption of utility without Architect's, Construction Manager's, and Owner's written permission.
- B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.
 - 1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Architect if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that are either new or in serviceable condition.
- B. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.
- C. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- D. Tiebacks: Steel bars, ASTM A 722/A 722M.
- E. Tiebacks: Steel strand, ASTM A 416/A 416M.

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 that could develop during excavation support and protection system operations.
 - 1. Shore, support, and protect utilities encountered.
- B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, 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.
- C. Locate excavation support and protection systems clear of permanent construction so that forming and finishing of concrete surfaces are not impeded.
- D. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.
- E. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

3.2 REMOVAL AND REPAIRS

- A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.
 - 1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlaying construction and abandon remainder.
 - 2. Fill voids immediately with approved backfill compacted to density specified in Division 31 Section "Earth Moving."
 - 3. Repair or replace, as approved by Architect, adjacent work damaged or displaced by removing excavation support and protection systems.
- B. Leave excavation support and protection systems permanently in place.

END OF SECTION 315000

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SECTION 321313 CONCRETE PAVING

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 exterior cement concrete pavement for the following:
 - 1. Stairs.
 - 2. Mow strips
 - 3. Walkways.
- B. Related Sections include the following:
 - 1. Division 03 Section "Cast-in-Place Concrete" for general building applications of concrete.
 - 2. Division 31 Section "Earth Moving" for subgrade preparation, grading, and subbase course.
 - 3. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants of joints in concrete pavement and at isolation joints of concrete pavement with adjacent construction.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.4 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Samples: 10-lb sample of exposed aggregate.
- D. Qualification Data: For manufacturer and testing agency.

- E. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:
 - 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.
- F. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
 - 1. Cementitious materials.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Fiber reinforcement.
 - 4. Admixtures.
 - 5. Curing compounds.
 - 6. Applied finish materials.
 - 7. Bonding agent or epoxy adhesive.
 - 8. Joint fillers.
- G. Field quality-control test reports.
- H. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
- C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.
- D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1. Before submitting design mixtures, review concrete pavement mixture design and examine procedures for ensuring quality of concrete materials and concrete pavement construction practices. Require representatives, including the following, of each entity directly concerned with concrete pavement, to attend conference:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete producer.
 - d. Concrete pavement subcontractor.

1.6 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

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 Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 2. Products: Subject to compliance with requirements, provide one of the products specified.
 3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
 1. Use flexible or curved forms for curves with a radius 100 feet or less.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT (NO REINFORCEMENT USED FOR FLATWORK)

- A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- B. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.
- C. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
- D. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.
- E. Plain Steel Wire: ASTM A 82.
- F. Deformed-Steel Wire: ASTM A 496.
- G. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.
- H. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.
- I. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
- J. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:
 - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
 - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout the Project:
 - 1. Portland Cement and as specified in Division 3 except that for exterior concrete, the minimum compressive strength is 5000 psi at 28 days.
- B. Normal-Weight Aggregates: ASTM C 33, coarse aggregate, uniformly graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar pavement applications and service conditions using similar aggregates and cementitious materials.
 - 1. Maximum Coarse-Aggregate Size: 1 inch nominal.

2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Exposed Aggregate: Selected, hard, and durable; washed; free of materials with deleterious reactivity to cement or that cause staining; from a single source, with gap-graded coarse aggregate as follows:
 1. Aggregate Sizes: 3/4 to 1 inch nominal.
 2. Aggregate Source, Shape, and Color and as required by the architect.
- D. Water: ASTM C 94/C 94M.
- E. Air-Entraining Admixture: ASTM C 260.
- F. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.
- 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.
 1. Products:
 - a. Axim Concrete Technologies; Cimfilm.
 - b. Burke by Edeco; BurkeFilm.
 - c. ChemMasters; Spray-Film.
 - d. Conspec Marketing & Manufacturing Co., Inc.; Aquafilm.
 - e. Dayton Superior Corporation; Sure Film.
 - f. Euclid Chemical Company (The); Eucobar.
 - g. Kaufman Products, Inc.; Vapor Aid.
 - h. Lambert Corporation; Lambco Skin.
 - i. L&M Construction Chemicals, Inc.; E-Con.

- j. MBT Protection and Repair, ChemRex Inc.; Confilm.
 - k. Meadows, W. R., Inc.; Sealtight Evapre.
 - l. Metalcrete Industries; Waterhold.
 - m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
 - n. Sika Corporation, Inc.; SikaFilm.
 - o. Symons Corporation; Finishing Aid.
 - p. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.
- E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- 1. Products:
 - a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
 - b. Burke by Edoko; Aqua Resin Cure.
 - c. ChemMasters; Safe-Cure Clear.
 - d. Conspec Marketing & Manufacturing Co., Inc.; W.B. Resin Cure.
 - e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
 - f. Euclid Chemical Company (The); Kurez DR VOX.
 - g. Kaufman Products, Inc.; Thinfilm 420.
 - h. Lambert Corporation; Aqua Kure-Clear.
 - i. L&M Construction Chemicals, Inc.; L&M Cure R.
 - j. Meadows, W. R., Inc.; 1100 Clear.
 - k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
 - l. Symons Corporation; Resi-Chem Clear.
 - m. Tamms Industries Inc.; Horn cure WB 30.
 - n. Unitex; Hydro Cure 309.
 - o. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.
- F. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.
- 1. Products:
 - a. Anti-Hydro International, Inc.; AH Curing Compound #2 WP WB.
 - b. Burke by Edoco; Resin Emulsion White.
 - c. ChemMasters; Safe-Cure 2000.
 - d. Conspec Marketing & Manufacturing Co., Inc.; W.B. Resin Cure.
 - e. Dayton Superior Corporation; Day-Chem White Pigmented Cure (J-10-W).
 - f. Euclid Chemical Company (The); Kurez VOX White Pigmented.
 - g. Kaufman Products, Inc.; Thinfilm 450.
 - h. Lambert Corporation; Aqua Kure-White.
 - i. L&M Construction Chemicals, Inc.; L&M Cure R-2.
 - j. Meadows, W. R., Inc.; 1200-White.
 - k. Symons Corporation; Resi-Chem White.
 - l. Tamms Industries, Inc.; Horn cure 200-W.
 - m. Unitex; Hydro White.
 - n. Vexcon Chemicals, Inc.; Certi-Vex Enviocure White 100.

2.6 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to requirements, and as follows:
 - 1. Types I and II, non-load bearing and types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Chemical Surface Retarder: Water-soluble, liquid-set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch.
 - 1. Products:
 - a. Burke by Edeco; True Etch Surface Retarder.
 - b. ChemMasters; Exposee.
 - c. Conspec Marketing & Manufacturing Co., Inc.; Delay S.
 - d. Euclid Chemical Company (The); Surface Retarder S.
 - e. Kaufman Products, Inc.; Expose.
 - f. Metalcrete Industries; Surfard.
 - g. Nox-Crete Products Group, Kinsman Corporation; Crete-Nox TA.
 - h. Scofield, L. M. Company; Lithotex.
 - i. Sika Corporation, Inc.; Rugasol-S.
 - j. Vexcon Chemicals, Inc.; Certi-Vex Envioset.

2.7 PAVEMENT MARKINGS

- A. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with FS TT-P-115, Type I or II or AASHTO M 248, Type N or F.
 - 1. Color: White, Yellow, Blue. See Section 321216 for color locations.
- B. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, with drying time of less than 45 minutes.
 - 1. Color: White, Yellow, Blue. See Section 321216 for color locations.

- C. Glass Beads: AASHTO M 247, Type 1.

2.8 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.
- B. Proportion mixtures to provide normal-weight concrete with the following properties:
1. Compressive Strength (28 Days): 5000 psi
 2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45
 3. Select slump limit from options in subparagraph below or revise to suit Project.
 4. Slump Limit: 4 inches, plus or minus 1 inch.
- C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
1. Air Content: 5-8 percent nominal maximum aggregate size.
- D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing admixture, high-range, water-reducing admixture, high-range, water-reducing and retarding admixture, plasticizing, and retarding admixture in concrete, as required, for placement and workability.
 2. Specify admixtures as part of submittal. Verify that admixtures proposed do not adversely effect stained concrete and will not modify colors of stain.
 3. Coordinate acceptability of admixtures with architect.
- F. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements as follows:
1. Fly Ash or Pozzolan: 25 percent.
 2. Ground Granulated Blast-Furnace Slag: 50 percent.
 3. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or pozzolan not exceeding 25 percent.
- G. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd. where specified and approved in mix submittal.
- H. Color Stain: Add stain to concrete per manufacturers recommendations and to meet color required by architect and owner on areas of stained concrete.

2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.
 - 1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 - 1. For concrete mixes of 1 cu. yd. or smaller, 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.
 - 2. For concrete mixes larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
 - 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.
 - 1. Completely proof-roll subbase in one 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 or similar axel weight vehicle.
 - 3. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch require correction according to requirements in Division 31 Section "Earth Moving."
- C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required 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.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
 - 1. When joining existing pavement, place transverse joints to align with previously placed joints, 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.
 - 1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
 - 2. Provide tie bars at sides of pavement strips where indicated.

3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
 5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.
- 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.
1. Locate expansion joints at intervals of 50 feet, unless otherwise indicated.
 2. Extend joint fillers full width and depth of joint.
 3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
 6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- 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, as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
 3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.
- 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.

3.6 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery or at Project site.
- F. Do not add water to fresh concrete after testing.
- G. 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.
- H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- I. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
 - 1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Architect.
- J. Screed pavement surfaces with a straightedge and strike off.
- K. 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.
- L. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish,

and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

- M. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.
 - 1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.
- N. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.
- O. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.
- P. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
 - 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 - 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 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. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. 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. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.
4. Coordinate with architect the locations of each type of finish.

3.8 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. 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, screeding, and bull floating or darbying concrete, but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
 1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.9 PAVEMENT TOLERANCES

- A. Comply with tolerances of ACI 117 and as follows:
 - 1. Elevation: 1/4 inch.
 - 2. Thickness: Plus 3/8 inch, minus 1/4 inch.
 - 3. Surface: Gap below 10-foot-long, unleveled straightedge not to exceed 1/4 inch.
 - 4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
 - 5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.
 - 6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.
 - 7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.
 - 8. Joint Spacing: 3 inches.
 - 9. Contraction Joint Depth: Plus 1/4 inch, no minus.
 - 10. Joint Width: Plus 1/8 inch, no minus.

3.10 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow concrete pavement to cure for 14 days and be dry before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
 - 1. Spread glass beads uniformly into wet pavement markings at a rate of 6 lb/gal.

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. or 5000 sq. ft. or fraction thereof of each concrete mix placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
 6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
- G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.12 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. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. 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 321313

SECTION 321373 CONCRETE PAVING JOINT SEALANTS

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. Expansion and contraction joints within cement concrete pavement.
 - 2. Joints between cement concrete and asphalt pavement.
- B. Related Sections include the following:
 - 1. Division 07 Section "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.
 - 2. Division 32 Section "Asphalt Paving" for constructing joints between concrete and asphalt pavement.
 - 3. Division 32 Section "Concrete Paving" for constructing joints in concrete pavement.

1.3 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Verification: For each type and color of joint sealant required. Install joint-sealant samples in 1/2-inch wide joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
- D. Qualification Data: For installer and testing agency.
- E. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for sealants.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- 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 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.
 - 2. Submit not fewer than six (6) 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 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. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing of current sealant products within a 36-month period preceding the commencement of the Work.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 for testing indicated, as documented according to ASTM E 548.

1.5 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 multi-component materials.
- B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

- A. 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 ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 - 3. When joint substrates are wet or covered with frost.
 - 4. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 5. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.
- B. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

- 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.

2.3 COLD-APPLIED JOINT SEALANTS

- A. Multi-component Jet-Fuel-Resistant Sealant for Concrete: Pourable, chemically curing elastomeric formulation complying with the following requirements for formulation and with ASTM C 920 for type, grade, class, and uses indicated:
 - 1. Urethane Formulation: Type M; Grade P; Class 12-1/2; Uses T, M, and, as applicable to joint substrates indicated, O.
 - a. Available Products:
 - 1) Pecora Corporation; Urexpam NR-300.
 - 2) Engineer approved equal.
 - 2. Coal-Tar-Modified Polymer Formulation: Type M; Grade P; Class 25; Uses T and, as applicable to joint substrates indicated, O.
 - a. Available Products:
 - 1) Meadows, W. R., Inc.; Sealtight Gardox.
 - 2) Engineer Approved Equal.
 - 3. Bitumen-Modified Urethane Formulation: Type M; Grade P; Class 25; Uses T, M, and, as applicable to joint substrates indicated, O.
 - a. Available Products:
 - 1) Tremco Sealant/Waterproofing Division; Vulkem 202.
 - 2) Engineer approved Equal.
- B. Single-Component Jet-Fuel-Resistant Urethane Sealant for Concrete: Single-component, pourable, coal-tar-modified, urethane formulation complying with ASTM C 920 for Type S; Grade P; Class 25; Uses T, M, and, as applicable to joint substrates indicated, O.

1. Available Products:

- a. Sonneborn, Div. of ChemRex, Inc.; Sonomeric 1.
- b. Engineer Approved Equal.

- C. Type NS Silicone Sealant for Concrete: Single-component, low-modulus, neutral-curing, nonsag silicone sealant complying with ASTM D 5893 for Type NS.

1. Available Products:

- a. Crafcro Inc.; RoadSaver Silicone.
- b. Dow Corning Corporation; 888.
- c. Engineer Approved Equal.

- D. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.

1. Available Products:

- a. Crafcro Inc.; RoadSaver Silicone SL.
- b. Dow Corning Corporation; 890-SL.
- c. Engineer Approved Equal.

- E. Multi-component Low-Modulus Sealant for Concrete and Asphalt: Proprietary formulation consisting of reactive petropolymer and activator components producing a pourable, self-leveling sealant.

1. Available Products:

- a. Meadows, W. R., Inc.; Sof-Seal.
- b. Engineer Approved Equal.

2.4 HOT-APPLIED JOINT SEALANTS

- A. Jet-Fuel-Resistant Elastomeric Sealant for Concrete: Single-component formulation complying with ASTM D 3569.

1. Available Products:

- a. Crafcro Inc.; Superseal 444/777.
- b. Meadows, W. R., Inc.; Poly-Jet 3569.
- c. Engineer Approved Equal.

- B. Jet-Fuel-Resistant Sealant for Concrete and Tar Concrete: Single-component formulation complying with ASTM D 3581.

1. Available Products:

- a. Crafcro Inc.; Superseal 1614A.
- b. Meadows, W. R., Inc.; Poly-Jet 1614.
- c. Meadows, W. R., Inc.; Poly-Jet 3406.
- d. Meadows, W. R., Inc.; Poly-Jet 3569.
- e. Engineer Approved Equal.

C. Elastomeric Sealant for Concrete: Single-component formulation complying with ASTM D 3406.

1. Available Products:

- a. Crafcro Inc.; Superseal 444/777.
- b. Meadows, W. R., Inc.; Poly-Jet 3406.
- c. Engineer Approved Equal.

D. Sealant for Concrete and Asphalt: Single-component formulation complying with ASTM D 3405.

1. Available Products:

- a. Koch Materials Company; Product No. 9005.
- b. Koch Materials Company; Product No. 9030.
- c. Meadows, W. R., Inc.; Sealtight Hi-Spec.
- d. Engineer Approved Equal.

2.5 JOINT-SEALANT BACKER MATERIALS

- A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.
- B. Round Backer Rods for Cold- and Hot-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.
- C. Backer Strips for Cold- and Hot-Applied Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.
- D. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

2.6 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 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
 - 1. 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.
- B. Joint Priming: Prime joint substrates where indicated or 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.

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 in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install backer materials 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 backer materials.
 - 2. Do not stretch, twist, puncture, or tear backer materials.
 - 3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.
- D. Install sealants using proven techniques that 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.
- E. 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 joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions, unless otherwise indicated.
- G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

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 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 and replace with joint sealant so installations with repaired areas are indistinguishable from the original work.

END OF SECTION 321373

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SECTION 323223 - SEGMENTAL RETAINING WALLS

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 segmental retaining walls with soil reinforcement.
- B. Related Sections:
 - 1. Division 03 Section "Cast-in-Place Concrete" for segmental retaining wall footings.
 - 2. Division 04 Section "Unit Masonry" for concrete masonry units.
 - 3. Division 32 Section for excavation for segmental retaining walls.

1.3 PERFORMANCE REQUIREMENTS

- A. Basis of Design: Design of segmental retaining walls is based on products indicated. Provide engineering design for proposed products, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Delegated Design: Design segmental retaining walls, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Structural Performance: Engineering design shall be based on the following loads and be according to NCMA's "Design Manual for Segmental Retaining Walls."
 - 1. Gravity loads due to soil pressures resulting from grades and sloped backfill indicated on project plans.
- D. Seismic Performance: Engineering design shall be based on the following loads and factors and be according to NCMA's "Segmental Retaining Walls - Seismic Design Manual."
 - 1. Gravity loads due to soil pressures resulting from grades and sloped backfill indicated.
 - 2. Horizontal Peak Ground Acceleration (A) for Project: Refer to the geotechnical report for this information.

1.4 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform the following preconstruction testing:
 - 1. Test soil reinforcement and backfill materials for pullout resistance according to ASTM D 6706.

2. Test soil reinforcement and backfill materials for coefficient of friction according to ASTM D 5321.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For concrete units.
- C. Samples for Verification: For each color and texture of concrete unit required. Submit full-size units including typical face and typical cap units.
- D. Delegated-Design Submittal: For segmental retaining walls 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. Compliance Review: Qualified professional engineer responsible for segmental retaining wall design shall review and approve submittals and source and field quality-control reports for compliance of materials and construction with design.
- E. Qualification Data: For qualified professional engineer and testing agency.
- F. Product Certificates: For segmental retaining wall units from manufacturer.
 1. Include test data for shear strength between segmental retaining wall units according to ASTM D 6916.
 2. Include test data for connection strength between segmental retaining wall units and soil reinforcement according to ASTM D 6638.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for segmental retaining wall units.
 1. Include test data for freeze-thaw durability of segmental retaining wall units.
 2. Include test data for shear strength between segmental retaining wall units according to ASTM D 6916.
 3. Include test data for connection strength between segmental retaining wall units and soil reinforcement according to ASTM D 6638.
- H. Preconstruction test reports.
- I. Source quality-control reports.
- J. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects.
 1. Build mockup of segmental retaining wall approximately 72 inches long by not less than 30 inches high above finished grade at front of wall.

- a. Include typical soil reinforcement.
 - b. Include typical base and cap or finished top construction.
 - c. Include backfill to typical finished grades at both sides of wall.
 - d. Include typical end construction at one end of mockup.
- 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- C. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to segmental retaining walls including, but not limited to, the following:
 - a. Structural load limitations.
 - b. Construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - c. Field quality-control procedures.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle concrete units and accessories to prevent deterioration or damage due to contaminants, breaking, chipping, or other causes.
- B. Store geosynthetics in manufacturer's original packaging with labels intact. Store and handle geosynthetics to prevent deterioration or damage due to sunlight, chemicals, flames, temperatures above 160 deg F or below 32 deg F, and other conditions that might damage them. Verify identification of geosynthetics before using and examine them for defects as material is placed.

PART 2 - PRODUCTS

2.1 SEGMENTAL RETAINING WALL UNITS

- A. Concrete Units: ASTM C 1372, Normal Weight, except that maximum water absorption shall not exceed 7 percent by weight and units shall not differ in height more than plus or minus 1/16 inch from specified dimension.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work:
 - a. Allan Block Corporation.
 - b. Keystone - Design Standard
 - c. Rockwood Retaining Walls, Inc.
 - d. Versa-Lok Retaining Wall Systems; a division of Kiltie Corporation.
 - 2. Provide units that comply with requirements for freeze-thaw durability.
 - 3. Provide units that interlock with courses above and below by means of integral lugs, lips, pins, or hollow cores filled with drainage fill.
 - 4. The use of a Design Standard establishes a level of quality for the work and is not to be construed as a limit of competition or a restraint of trade.

- B. Color: AS SELECTED BY ARCHITECT
- C. Shape and Texture: Provide units of a straight plane shape and dimensions that will produce segmental retaining walls of dimensions and profiles indicated without interfering with other elements of the Work and with machine-split textured faces
- D. Cap Units: Provide cap units of same shape as other units with smooth, as-cast top surfaces without holes or lugs.
- E. Special Units: Provide corner units, end units, and other shapes as needed to produce segmental retaining walls of dimensions and profiles indicated and to provide texture on exposed surfaces matching face.

2.2 INSTALLATION MATERIALS

- A. Pins: Product supplied by segmental retaining wall unit manufacturer for use with units provided, made from nondegrading polymer reinforced with glass fibers.
- B. Cap Adhesive: Product supplied or recommended by segmental retaining wall unit manufacturer for adhering cap units to units below.
- C. Leveling Base: Comply with requirements in Division 31 Section "Earth Moving" for base material and Division 33 Section "Subdrainage" for drainage fill.
 - 1. Leveling Course: Use untreated base course, or structural fill or Lean concrete with a compressive strength of not more than 500 psi.
- D. Drainage Fill: Comply with requirements in Division 32 Section "Subdrainage."
- E. Nonreinforced-Soil Fill: Comply with requirements in Division 32 Section "Earthwork" for satisfactory soils.
- F. Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent.
 - 1. Apparent Opening Size: No. 70 to 100 sieve, maximum; ASTM D 4751.
 - 2. Minimum Grab Tensile Strength: 110 lb; ASTM D 4632.
 - 3. Minimum Weight: 4 oz./sq. yd.
- G. Subdrainage Pipe and Filter Fabric: Comply with requirements in Division 32 Section "Subdrainage."

2.3 SOURCE QUALITY CONTROL

- A. Direct manufacturer to test and inspect each roll of soil reinforcement at the factory for minimum average roll values for geosynthetic index property tests, including the following:
 - 1. Weight.
 - 2. Roll size.
 - 3. Grab or single-rib strength.
 - 4. Aperture opening.
 - 5. Rib or yarn size.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for excavation tolerances, condition of subgrades, and other conditions affecting performance of segmental retaining walls.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 RETAINING WALL INSTALLATION

- A. General: Place units according to NCMA's "Segmental Retaining Wall Installation Guide" and segmental retaining wall unit manufacturer's written instructions.
 - 1. Lay units in running bond.
 - 2. Form corners and ends by using special units, cutting units with motor-driven saw or splitting units with mason's hammer and chisel.
- B. Leveling Base: Place and compact base material to thickness indicated and with not less than 95 percent maximum dry unit weight according to ASTM D 698.
 - 1. Leveling Course: At Contractor's option, unreinforced lean concrete may be substituted for upper 1 to 2 inches (25 to 50 mm) of base. Compact and screed concrete to a smooth, level surface.
- C. First Course: Place first course of segmental retaining wall units for full length of wall. Place units in firm contact with each other, properly aligned and level.
 - 1. Tamp units into leveling base as necessary to bring tops of units into a level plane.
- D. Subsequent Courses: Remove excess fill and debris from tops of units in course below. Place units in firm contact, properly aligned, and directly on course below.
 - 1. For units with lugs designed to fit into holes in adjacent units, lay units so lugs are accurately aligned with holes, and bedding surfaces are firmly seated on beds of units below.
 - 2. For units with lips at front of units, slide units as far forward as possible for firm contact with lips of units below.
 - 3. For units with lips at bottom rear of units, slide units as far forward as possible for firm contact of lips with units below.
- E. Cap Units: Place cap units and secure with cap adhesive.

3.3 FILL PLACEMENT

- A. General: Comply with requirements in Division 2 Section "Earthwork," NCMA's "Segmental Retaining Wall Installation Guide," and segmental retaining wall unit manufacturer's written instructions.
- B. Fill voids between and within units with drainage fill. Place fill as each course of units is laid.

- C. Place, spread, and compact drainage fill and soil fill in uniform lifts for full width and length of embankment as wall is laid. Place and compact fills without disturbing alignment of units. Where both sides of wall are indicated to be filled, place fills on both sides at same time. Begin at wall and place and spread fills toward embankment.
 - 1. Use only hand-operated compaction equipment within 48 inches of wall, or one-half of height above bottom of wall, whichever is greater.
 - 2. Compact reinforced-soil fill to not less than 95 percent maximum dry unit weight according to ASTM D 698.
 - a. In areas where only hand-operated compaction equipment is allowed, compact fills to not less than 95 percent maximum dry unit weight according to ASTM D 698.
- D. Place drainage geotextile against back of wall and place layer of drainage fill at least 6 inches wide behind drainage geotextile to within 12 inches of finished grade. Place another layer of drainage geotextile between drainage fill and soil fill.
- E. Place a layer of drainage fill at least 6 wide behind wall to within 12 inches of finished grade. Place a layer of drainage geotextile between drainage fill and soil fill.
- F. Wrap subdrainage pipe with filter fabric and place in drainage fill. Daylight at end of walls and through walls at not less than 50 feet on center.
- G. Place impervious fill over top edge of drainage fill layer.
- H. Slope grade at top of wall away from wall unless otherwise indicated. Slope grade at base of wall away from wall. Provide uniform slopes that will prevent ponding.

3.4 CONSTRUCTION TOLERANCES

- A. Variation from Level: For bed-joint lines along walls, do not exceed 1-1/4 inches in 10 feet maximum.
- B. Variation from Indicated Batter: For slope of wall face, do not vary from indicated slope by more than 1-1/4 inches in 10 feet.
- C. Variation from Indicated Wall Line: For walls indicated as straight, do not vary from straight line by more than 1-1/4 inches in 10 feet.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Comply with requirements in Division 2 Section "Earthwork" for field quality control.
 - 1. In each compacted backfill layer, perform at least 1 field in-place compaction test for each 150 feet or less of segmental retaining wall length.

3.6 ADJUSTING

- A. Remove and replace segmental retaining wall construction of the following descriptions:

1. Broken, chipped, stained, or otherwise damaged units. Units may be repaired if Architect approves methods and results.
 2. Segmental retaining walls that do not match approved Samples.
 3. Segmental retaining walls that do not comply with other requirements indicated.
- B. Replace units so segmental retaining wall matches approved Samples and mockups, complies with other requirements, and shows no evidence of replacement.

END OF SECTION 323223

SECTION 328400 - IRRIGATION 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 valves, piping, sprinklers, specialties, accessories, controls, and wiring for irrigation systems.
- B. Field verify capacity of the existing irrigation system complete including but not limited to flow, capacity, controller operation and etc.
- C. Repair and remodel sections of the existing irrigation system as required.
- D. Remodel sections of the existing irrigation system during construction of the project as required to maintain the viability of all plant material on the site shown to remain during construction activities.
- E. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section 011000 SUMMARY
 - 2. APPENDIX– Soils Report for reference only.
 - 3. Division 32 Section Landscape Planting
 - 4. Division 26 Sections for electrical power materials and installations.

1.3 DEFINITIONS

- A. Piping sizes used in this Section are normal pipe size (NPS) in inches. Tube sizes are standard size in inches. Equivalent SI (metric) sizes are indicated in millimeters (mm) in parentheses.
- B. Supply Piping: Piping from water source to connection to irrigation system pressure piping. Piping is under same pressure as water supply. Piping in this category is not included in this Section.
- C. Pressure Piping: Piping downstream from supply piping to and including control valves. Piping is under irrigation system pressure. Piping in this category includes pressure regulators, water meters, and backflow preventers, when used.
- D. Circuit Piping: Piping downstream from control valves to irrigation system sprinklers, emitters, devices, and drain valves. Piping is under pressure (less than pressure piping) during flow.
- E. Control Valve: Manual or automatic (electrically operated) valve for control water flow to irrigation system zone, including isolation or zone valves.
- F. Drain Piping: Downstream from circuit or pressure piping drain valves. Piping is not under pressure.
- G. Drain Valve: Manual drain valve for draining of irrigation system circuit piping.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. Location of Sprinkler and Devices: Design location is approximate. Make minor adjustments necessary to avoid planting and obstructions such as signs and light standards.
- B. Minimum Water Coverage: Not less than:
 - 1. Turf Areas: 100 percent.
 - 2. Other Planting Areas: 100 percent.
- C. Components and Installation: Capable of producing piping systems with the following minimum working pressure ratings except where indicated otherwise.
 - 1. Pressure Piping: 150 psig (1035 kPa).
 - 2. Circuit and Drain Piping: 100 psig (690 kPa).

1.5 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data including pressure rating, rated capacity, settings, and electrical data of selected models for the following:
 - 1. Valves, including general-duty, underground, air relief, manual and automatic control, and quick-coupler types, and valve boxes.
 - 2. Sprinklers, including emitters, drip tubes, and devices.
 - 3. Controls, including controller wiring diagrams.
 - 4. Wiring and fittings.
 - 5. Pipe, including sleeves, lateral, supply, conduit and drain.
 - 6. Plastic pipe cement.
- C. Wiring diagrams for electrical controllers, valves, and devices.
- D. Maintenance data for inclusion in "Operating and Maintenance Manual" specified in Division 1 Section "Project Closeout" for the following:
 - 1. Automatic control valves.
 - 2. Sprinklers.
 - 3. Controllers.
- E. Irrigation Schedule: A monthly Irrigation Schedule shall be prepared that covers the initial 120-day plant establishment period and the typical long-term use period. This schedule shall consist of a table with the following information for each valve:
 - 1. Plant type (for example, turf, trees, low water use plants);
 - 2. Irrigation type (for example, sprinklers, drip, bubblers);
 - 3. Flow rate in gallons per minute;
 - 4. Precipitation rate in inches per hour (sprinklers only);
 - 5. Run time in minutes per day;
 - 6. Number of water days per week, and
 - 7. Cycle time to avoid runoff.

The irrigation schedule shall rely on the estimated landscape water use calculations and shall be adjusted as necessary for irrigation efficiency, soil conditions, slope, and microclimate conditions.

- F. Water Use Efficiency Review: Following construction a Water Use Efficiency Review (Audit) will be conducted by a certified Landscape Irrigation Auditor. The auditor shall be independent of the contractor, design firm and owner / developer of the project. The water performance audit will verify that the irrigation system complies with the minimum standards required by this ordinance. The auditor shall furnish a certificate to the OWNER, Landscape Architect and installer certifying compliance with the minimum distribution requirements and an irrigation schedule.
- G. Maintenance data for inclusion in "Operating and Maintenance Manual" specified in Division 1 Section "Project Closeout" for the following:
 - 1. Automatic control valves.
 - 2. Sprinklers.
 - 3. Controllers.

1.6 QUALITY ASSURANCE

- A. Comply with requirements of utility supplying water for prevention of backflow and back siphonage.
- B. Comply with requirements of authority with jurisdiction for irrigation systems.
- C. Installer Qualifications: Engage an experienced installer who has completed minimum of 6 irrigation systems similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.
- D. Listing/Approval Stamp, Label, or Other Marking: On equipment, specialties, and accessories made to specified standards.
- E. Listing and Labeling: Equipment, specialties, and accessories that is listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in "National Electrical Code," Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- F. Product Options: Irrigation system piping, specialties, and accessories are based on specific types, manufacturers, and models indicated. Components with equal performance characteristics produced by other manufacturers may be considered, provided deviations in dimensions, operation, and other characteristics do not change design concept or intended performance as judged by the Architect, unless noted "No Substitute". The burden of proof of product equality is on the Contractor. Refer to Division 1 Section "Product Substitutions." No requests for substitutions will be reviewed after bids have been received by Owner.

1.7 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Verify that irrigation system piping may be installed in compliance with original design and referenced standards. Report to the Landscape Architect in writing any contradictions between the site, the drawings and the specifications.

- B. Site Information: Reports on subsurface condition investigations made during design of the Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions (between soil borings). Owner assumes no responsibility for interpretations or conclusions drawn from this information.

1.8 SEQUENCING AND SCHEDULING

- A. Maintain uninterrupted water service to building during normal working hours. Arrange for temporary water shutoff with Owner.
- B. Coordinate irrigation systems work with landscape work specified in Division 32 Section 329300 - Landscape Planting.

1.9 EXTRA MATERIALS

- A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below. Package them with protective covering for storage and label clearly describing contents.
 - 1. Quick Couplers: Furnish quantity of units equal to 10% of amount of each size installed, but not less than 1.
 - 2. Sprinklers: Furnish quantity of units equal to 10% of amount of each type installed, but not less than 10.
 - 3. Dripper Tube: Furnish quantity of units equal to 10% of amount of each type installed.
 - 4. Valve Keys: Furnish quantity of tee-handle units equal to 25% of amount of each type key-operated, control valve installed, but not less than 2 each.
 - 5. Quick Coupler Hose Swivels: Furnish quantity of units equal to 25% of amount of each type quick coupler installed, but not less than 2.
 - 6. Quick Coupler Operating Keys: Furnish quantity of units equal to 25% of amount of each type quick coupler installed, but not less than 3.

1.10 WARRANTY/GUARANTEE

- A. During the period of one (1) year from and after the final acceptance of the completed irrigation system, the Contractor shall at his own expense, make all needed repairs or replacement due to defective workmanship or materials which in the judgment of the Owner or Owner's representative, shall become necessary during such period. If, within seven (7) calendar days after mailing of the written notice or verified communication by the Owner to the Contractor or his agent, requesting such repairs or replacement, the Contractor shall neglect to make repairs, Owner may make such repairs at the Contractor's expense. In the case of emergency where, in the judgment of the Owner, delay could cause serious loss, hazard or damage to persons or property, then repairs, replacement and security, both temporary and/or permanent, may be provided by such persons as the Owner may employ, after verbal communication with Contractor without notice being sent to the Contractor, and the Contractor shall pay all costs related thereto.
- B. The guarantee shall be in the form of a letter from the Contractor addressed to the Owner. The letter shall incorporate the language stated above and be signed by an authorized officer/agent or Owner of the Contractor.

- C. During the guarantee period, the Contractor will drain the system in the fall and put the system back into operation in the Spring. This work shall be done in the presence of the Owner's representative and maintenance personnel.

1.11 RECORD DRAWINGS:

- A. Any deviation from plan layout should be indicated on the final "Record" Drawings. This Contractor shall make an exact measured and dimensioned drawing showing locations of all piping, wiring, control, valves and quick coupler valves.
- B. Record Drawings shall be furnished to the Landscape Architect at the time of Substantial Completion Inspection before a letter of Substantial Completion for the irrigation sprinkler system will be issued.
- C. The Contractor shall supply the Landscape Architect with record drawing information in AutoCAD format before final acceptance of the irrigation system. The following shall be included on Irrigation Record Drawings. In addition, provide a reduced color-coded drawing(s) showing all zones and assigned valves.
1. Note all points of connection (P.O.C.) include tap size, line size and static water pressure (P.S.I.) of service.
 2. Provide name and phone number of the servicing water purveyor include the name and date the installer was completed and the date the as-built drawing was approved.
 3. Accurately locate the following major components by dimension and their size as installed on the project. (But not limited to the following):
 - Water Meters
 - Backflow Preventers
 - Pressure Reducing Valves (note pressure settings)
 - Filters
 - Stop and Waste
 - Master Control Valves
 - Control Wire Junction Boxes
 - Pumps
 - Flow Sensors
 - Remote Control Valves (note station assignment, size flow rate, pressure setting, D.U. and actual flow rates. If available from water audit).
 - Drip System Pressure Regulators and Filters
 - Quick Couplers and Hose Bibs
 - Pressure Main Lines and Future P.O.C.'s
 - Manual Drain Valves and Sumps
 - Remote Control Wire (label both ends in junction box)
 - Controller Location(s) (Note manufacturer, model, size and number of station used)
 - Central Control
 - Rain Sensors
 - Moisture Sensors
 - Note and identify location(s) of existing utility systems as encountered during installation, i.e.; gas, phone, sewer, etc.
 - Air Release Valves
 4. Indicate and show the following additional components installed on the project:

- All Sprinkler Heads
- Lateral Lines and Sizes
- Lateral Lines Sleeves and Sizes
- Manual or Automatic Flush Valves

1.12 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver irrigation system components in manufacturer's original undamaged and unopened containers with labels intact and legible.
- B. Deliver plastic piping in bundles, packaged to provide adequate protection of pipe ends, both threaded or plain.
- C. Store and handle materials to prevent damage and deterioration.
- D. Provide secure, locked storage for valves, sprinkler heads, and similar components that cannot be immediately replaced, to prevent installation delays.

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.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Gate Valves for Underground Installation:
 - a. American Darling Valve Div., American Cast Iron Pipe Co.
 - b. Clow Valve Co. Div., McWane, Inc.
 - c. Kennedy Valve Div., McWane, Inc.
 - d. Stockham Valves & Fittings, Inc.
 - e. Waterous Co.
 - 2. Corporation Stops for Underground Installation
 - a. Ford Meter Box Co., Inc.
 - b. Hays Div., Romac Industries.
 - c. A.Y. McDonald Mfg. Co.
 - d. Mueller Co., Grinnell Corp.
 - 3. Valves for Aboveground and Pit Installation
 - a. Grinnell Supply Sales Co., Grinnell Corp.
 - b. Nibco, Inc.
 - c. Stockham Valves & Fittings, Inc.
 - d. Walworth Co.
 - e. Watts Regulator Co.
 - 4. Automatic Control Valves
 - a. Rain Bird Sprinkler Mfg. Corp.
 - b. Hunter Industries
 - 5. Control Valve Boxes
 - a. Ametek by Plymouth Products Div., AMETEK

- b. Brooks Products, Inc., Polyplastics Div.
 - c. Carson - Oldcastle.
- 6. Quick Couplers
 - a. Rain Bird Sprinkler Mfg. Corp.
 - b. Hunter Industries
- 7. Sprinklers
 - a. Rain Bird Sprinkler Mfg. Corp.
 - b. Hunter Industries
- 8. Dripper Tubes, and Devices
 - a. Rain Bird Sprinkler Mfg. Corp.
 - b. Netafim USA, Inc.
 - c. Toro Co.
- 9. Controllers
 - a. Rain Bird Sprinkler Mfg. Corp.
 - b. Hunter Industries
- 10. Pipe
 - a. Pacific Western Extruded Plastics Co.
 - b. Eagle Pacific Industries, Inc.
 - c. J-M Manufacturing Company, Inc..
- 11. Master Valve
 - a. Netafim USA, Inc
 - b. Amiad USA

2.2 PIPES AND TUBES

- A. Refer to Part 3 Article "Piping Applications" for identification of systems where pipe and tube materials specified below are used.
- B. Polyvinyl Chloride (PVC) Plastic Pipe: ASTM D 1785, PVC 1120, Schedule 40, 160 psig (1100 kPa) minimum pressure rating for 3-inch (100-mm) and smaller sizes, with plain, threaded or bell ends.
 - 1. PVC Socket Fittings: Schedule 40: ASTM D 2466.
- C. Polyvinyl Chloride (PVC) Plastic Pipe: ASTM D 1785, PVC 1120 compound, Schedule 80.
 - 1. PVC Socket Fittings: Schedule 80: ASTM D 2467.
 - 2. PVC Threaded Fittings: Schedule 80: ASTM D 2464.
- D. PVC, Pressure-Rated Pipe: ASTM D 2241, PVC 1120 compound, SDR 21 Bell and Ring for pipe 4" and larger.
- E. Flexible Polyethylene Pipe: Rain Bird SPX-Flex-100 or Equal. Nominal inside dia. 0.437' pressure rated at 80 psi at 110°F.
- F. Pipe Sleeves: Pipe sleeves shall be PVC Class 160 or better.

2.3 PIPE AND TUBE FITTINGS

- A. Refer to Part 3 Article "Piping Applications" for identification of systems where pipe and tube fitting materials specified below are used.

- B. Cast-Bronze Flanges: ASME B16.24, Class 150, raised ground face, bolt holes spot faced.
- C. Polyvinyl Chloride (PVC) Plastic Pipe Fittings: ASTM D2467, Schedule 80, socket-type and ASTM D2464, Schedule 80, threaded fittings.
- D. Polyvinyl Chloride (PVC) Plastic Pipe Fittings: ASTM D2467, Schedule 40, socket-type and ASTM D2464, Schedule 40, threaded fittings.
- E. Polyvinyl Chloride (PVC) Plastic Pipe Fittings: ASTM D2241, PVC 1120 compound, SDR 21.
- F. Polyvinyl Chloride (PVC) Plastic Pipe Fittings: ASTM D2467, Schedule 40, socket-type.
- G. Ductile Iron: Deep Socket Cast Iron Fittings: ASTM A536, on all main line pipe 2½" or larger.
- H. Mechanical Joint: Mechanical Joint Steel Fittings: AWWA A21.10

2.4 JOINING MATERIALS

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for joining materials not included in this Section.
- B. Solvent Cement: ASTM F656 primer and ASTM D2564 solvent cement in color other than orange. Weld-on IPS P-70 primer and weld-on IPS PVC 711, plastic pipe cement.
- C. Gaskets for Plastic Flanged Joints: Materials recommended by plastic pipe and fittings manufacturer.
- D. Gaskets for Plastic Joints: Trans gaskets as recommended the fittings manufacturer.

2.5 BACKFLOW PREVENTERS

- A. Description: ASSE Standard backflow preventers, of size indicated for maximum flow rate and maximum pressure loss indicated.
 - 1. Working Pressure: 150 psig (1035 kPa) minimum except where otherwise indicated.
 - 2. 2-inches (DN 50) and Smaller: Bronze body with threaded ends.
 - 3. 2½-inches (DN 65) and Larger: Bronze, cast-iron, steel or stainless-steel body with flanged ends.
 - a. Interior Protective Coating: AWWA C550, epoxy coating for backflow preventers with cast-iron or steel body.
 - 4. Interior Components: Corrosion-resistant materials.
 - 5. Strainer supplied with and compatible for size and capacity with unit, on inlet, where strainer is indicated.
- B. Reduced-Pressure-Principle Backflow Preventer: ASSE 1013, with (OS&Y) gate valves on inlet and outlet and strainer on inlet. Include test cocks and pressure differential relief valve with ASME A112.1.2 air-gap fitting located between two positive-seating check valves for continuous pressure application.
 - 1. Pressure Loss: 15 psig (103 kPa) maximum, through middle third of flow range.

2. Gate valves supplied with and compatible for size and testing of unit on inlet and outlet. Valves 2-inches (DN 50) and smaller may be ball valves if these are unit manufacturer's standard valve for this application.
- C. The Contractor shall install backflow prevention equipment behind the point of connection (downstream) to the supplying utility lines and shall comply with local water district or State (whichever is most restrictive) requirements for such. See plans and details for more information. All valves to be lead free.
- D. Install a quick coupler just downstream of RPBA for blow out purposes.

2.6 VALVES

- A. General: Valves are for general-duty and underground applications. Refer to "Valve Applications" Article for locations of various valve types specified in this Article. Refer to "Control Valves" Article for control valves and accessories and "Backflow Preventers" Article for backflow preventer valves. All valves are to be lead free.
- B. Non rising Stem Gate Valves 3-inches (DN 80) and Larger: AWWA C500, cast-iron double disc, bronze disc and seat rings or AWWA C509, resilient seated; bronze stem, cast-iron, or ductile-iron body and bonnet, stem nut, 200 psig (1380 kPa) working pressure; and ends that fit NPS dimension, PVC pipe. Include elastomeric gaskets.
- C. Valve Boxes: Cast-iron box with top section and cover with lettering "WATER," bottom section with base to fit over valve and barrel approximately 5-inches (127 mm) in diameter, and adjustable cast-iron extension of length required for depth of bury of valve.
 1. Provide steel tee-handle shutoff rod with each valve box. Include tee-handle, shutoff rod with one pointed end, stem of length to operate valve, and end fitting valve operating nut.
- D. Curb Stops 2-inches (DN 50) and Smaller: Bronze body, ground key plug or ball, 150 psig (1035 kPa) minimum pressure rating, wide tee head, with inlet and outlet to match service piping material.
- E. Service Boxes for Curb Stops: Cast-iron box with telescoping top section of length required for depth of bury of valve. Include cover with lettering "WATER" and bottom section with base of size to fit over curb stop and barrel approximately 3-inches (75 mm) in diameter.
 1. Provide steel tee-handle shutoff rod with each service box. Include tee-handle, shutoff rod with one pointed end, stem of length to operate curb stop, and slotted end fitting curb stop head.
- F. Bronze, Non-rising Stem Gate Valves, 2-inches (DN 50) and Smaller: MSS SP-80, Type 1, solid wedge; non-rising, copper-silicon-alloy stem; Class 125, body and screw bonnet of ASTM B 62 cast bronze, with threaded or solder-joint ends. Include polytetrafluoroethylene (PTFE) – impregnated packing, brass packing gland, and malleable-iron hand wheel.
- G. Plastic Valves: Polyvinyl Chloride (PVC) Plastic, with 150 psig (1035 kPa) minimum pressure rating, ends compatible to piping where valve is to be installed, and tee handle.
- H. Ball Valves: Ball valves shall be solid bronze meeting Federal Specification WW-V-54, CLASS A, TYPE I. Size shall be the same size as the main line on which it is installed. Valves shall be installed on the up-stream side of the electric remote control valve manifold and in the same valve box. NOTE: Only one (1) ball valve required per manifold.

- I. Stop and Waste Valves: Stop and waste valves shall be solid bronze meeting Federal Specification WW-V-54, CLASS A, TYPE I. Provide an 8" round valve box over the PVC stand pipe.
- J. Drain Valves: All drain valves shall be $\frac{3}{4}$ " brass full turn ball cocks and installed as per details on the Drawings. Valves shall be tested for 150 psi working pressure. This valve is to be installed on mainlines only.
- K. Master Valve: The master valve and flow sensing device shall be a single, combined, unit with the capability of adding pressure regulation where needed. The valve shall be designed for high pressure, remote control applications via 14 AWG PE wire. The unit shall be double-chambered, and made of polyester coated cast iron, with a reinforced natural rubber valve diaphragm. No straight length of pipe will be required upstream or downstream of the device. Only globe configured valves will be used.
- L. Drain Valves: All drain valves shall be $\frac{3}{4}$ " brass full turn ball cocks and installed as per details on the Drawings. Valves shall be tested for 150 psi working pressure. This valve is to be installed on mainlines only.
- M. Description: Manufacturer's standard control valves for circuits, of type and size indicated, and as follows:
 - 1. Provide cast-bronze bodies, unless otherwise indicated.
 - 2. Manual Control Valves: MSS SP-80, Class 125, globe valves.
 - 3. Key-Operated, Manual Control Valves: MSS Sp-80, Class 125, globe valves, fitted for key operation.
 - 4. Automatic Control Valves: Diaphragm-type, normally closed, with manual flow adjustment, and operated by 24-volt-a.c. solenoid.
 - 5. Automatic Drain Valves: Designed to open for drainage when line pressure drops below 3 psig (20 kPa). Not for use on pressure piping.
 - 6. Quick-Couplers: Factory-fabricated, 2-piece assembly. Include coupler water-seal valve; removable upper body with spring-loaded or weighted, rubber-covered cap; hose swivel with ASME B1.20.7, $\frac{3}{4}$ -11.5NH Threads for garden hose on outlet; and operating key.
 - a. Locking Top Option: Include vandal-resistant, locking feature with two matching keys.
- N. Control Valve Boxes
 - 1. All control valves shall be housed in a Brook 141 9 standard series heavy duty plastic valve box using a bolt down lid with stainless steel bolts. No valve box shall rest directly upon the valve or any fixture associated with it. Each valve box shall be centered on the valve it covers. Each valve box shall have a 6 inches of pea gravel placed in the bottom underneath the valve and lines to reduce the potential of med and standing water therein.
 - 2. All connections made inside the box to connect wires to the valve shall be made inside a 3M-DBY connector. Each connector shall be completely sealed and water proof.
 - 3. All splices in control wire shall also be housed in a valve box, as specified above.
- O. Control Valve boxes: Polyethylene (PE), acrylonitrile-butadiene-styrene (ABS), fiberglass, polymer concrete, or precast concrete box and cover. Size as required for application.

1. Drainage Backfill: Cleaned gravel or crushed stone, graded from 3-inches (75 mm) maximum to ¾-inch (19 mm) minimum.
 2. Valve boxes shall be of sufficient size to house two (2) electric remote control valves with unions, and still allow room for maintenance without having to excavate or perform similar operations. Boxes shall have lock down lids and shall meet ASTM D638 for tensile strength of 4,300 pounds per square inch.
- P. Service Boxes for Key-Operated Control Valves: Cast-iron box with telescoping top section of length required for depth of bury of valve. Include cover with lettering "WATER," and bottom section with base of size to fit over curb stop and barrel approximately 3-inches (75 mm) in diameter.
1. Include valve key, 36-inches (915 mm) long with tee handle and key end to fit valve.

2.7 SPRINKLERS

- A. Description: Manufacturer's standard sprinklers designed to provide uniform coverage over entire area of spray shown on Drawings at available water pressure, as follows:
1. Housings: plastic, except where material is specified.
 2. Pop-up, Spray: Fixed pattern, with screw-type flow adjustment and stainless steel retraction spring.
 3. Pop-up, Rotary Spray: Gear drive, full-circle and adjustable part-circle type.
 4. Bubblers: Fixed pattern, with fixed flow, non-adjustable and pressure compensating.

2.8 AUTOMATIC CONTROL SYSTEM

- A. Description: Low-voltage controller system made for control of irrigation system automatic control valves. Controller operates on 120 volts a.c. building power system, provides 24 volts a.c. power to control valves.
- B. Exterior Control Enclosures: Weatherproof enclosure with locking cover and two matching keys. Enclosure construction complies with NFPA 70 and NEMA 250, Type 4, and includes provision for grounding.
1. Material: Enameled-steel, sheet metal.
- C. Transformer: Internal-type, and suitable for converting 120 volts a.c. building power to 24 volts a.c. power.
- D. Controller Stations for Automatic Control Valves: Include switch for manual or automatic operation of each station.
- E. Timing Device: Adjustable, 24-hour, 14-day clock to operate any time of day. See Irrigation Schedule and Legend for model and manufacturer.
- F. Lightning Protection: Provide manufacturer's standard lightning protection on each controller. Coordinate with electrical.
- G. Wiring: UL 493, solid copper conductor, insulated cable, suitable for direct burial.
1. Feeder Circuit Cables: Type UF, No. 14 AWG minimum, between valves and controllers.

2. Control Wiring: Rain Bird, MaxiCom approved signal communication wire, Type PE39 or approved equal.

H. Valve wire sizing chart: See Appendix A at end of section.

2.9 SLEEVES

- A. Sleeve Tape: Provide "Deep~1" Sleeve Magnets for marking irrigation sleeves.

2.10 IDENTIFICATION

- A. Refer to Division 2 Section "Earthwork" for plastic underground warning tapes.

2.11 THRUST BLOCKS

- A. All main lines shall have a thrust block of poured concrete installed at each change of direction. The thrust block shall be of sufficient size for the pipe involved and rest on undisturbed ground. Construct as follows:

STEP 1.

Multiply the working pressure by the appropriate value shown in the following table to obtain total thrust in N (lb.):

PIPELINE THRUST FACTORS * ^

Pipe size in.	mm	Dead end or tee	90° elbow	45° elbow	22° elbow
3"	89	9.80	13.90	7.51	3.82
3 1/2"	102	12.80	18.10	9.81	4.99
4"	114	16.20	23.00	12.40	6.31
5"	141	24.70	35.00	18.90	9.63
6"	168	34.80	49.20	26.70	13.60
8"	219	59.00	83.50	45.20	23.00
10"	273	91.50	130.00	70.00	35.80
12"	324	129.00	182.00	98.50	50.30

* Based on thrust per kPa (PSI) pressure.

^ Blocking for cross may not be needed with long branch lines.

STEP 2.

Determine the bearing strength of the soil from the table below:

BEARING STRENGTH OF SOILS

<u>Soils and safe bearing loads</u>	<u>lb/ft²</u>	<u>kPa</u>
Sound shale	10,000	500
Cemented gravel and sand		
difficult to pick	4,000	200
Coarse and fine compact sand	3,000	150
Medium clay - can be spaded	2,000	100
Soft clay	1,000	50
Muck	0	0
<i>See Soils Report for soil type</i>		

STEP 3.

Divide the total thrust obtained in Step 1 by the bearing strength of the soil to get the area needed, m²(ft²).

SIDE THRUST ALTERNATIVE PROCEDURE

Pipe size	Side thrust per degree.		
<u>in.</u>	<u>mm</u>	<u>lb</u>	<u>N</u>
3"	89	17.10	76.10
3 1/2"	102	22.40	99.60
4"	114	28.30	125.90
5"	141	43.10	191.70
6"	168	60.80	270.50
8"	219	103.00	458.20
10"	273	160.00	711.70
12"	324	225.00	1,000.80

* Based on side thrust per 689 kPa (100 PSI) pressure per degree of deflection.

NOTE: Multiply side thrust from table by degree of deflection times kPa (PSI) divided by 100 to obtain total side thrust in N(lb).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Investigate and determine available water supply, water pressure and flow characteristics.

3.2 PREPARATION

- A. Set stakes or flags to identify proposed sprinkler locations. Obtain Architect's approval before excavation.

3.3 PAVING WORK

- A. Cutting and patching of asphalt paving is specified in Division 2 Section "Hot-Mixed Asphalt Paving."
- B. Cutting and patching of concrete paving is specified in Division 2 Section "Portland Cement Concrete Paving."
- C. Install piping in sleeves where crossing sidewalks, roadways, parking lots, and railroads.

3.4 PIPING APPLICATIONS

- A. Refer to Part 2 of this Section for detailed specifications for pipe and fittings products listed below. Use pipe, tube, fittings, and joining methods according to the following applications. Piping in pits and aboveground may be joined with flanges instead of joints indicated.
- B. Use pipe, tube, fittings, and joining methods according to the following applications.

C. Pressure Piping Underground: Use the following:

1. 3-inches (DN 80) and Smaller: ASTM D 1785, Schedule 40, polyvinyl chloride (PVC) plastic pipe; ASTM D 2466, Schedule 40, PVC plastic, socket-type pipe fittings; and solvent-cemented joints.
2. 4-inches (DN 80) and Larger: ASTM D 2241, Class 200, polyvinyl chloride (PVC) plastic pipe; with gasketed bell ends.

D. Circuit Piping: Use the following:

1. All Sizes: ASTM D 1785, Schedule 40, polyvinyl chloride (PVC) plastic pipe; ASTM D 2466, Schedule 40, PVC plastic, socket-type fittings; and solvent-cemented joints.

E. Branches and Offsets at Sprinkler and Devices: ASTM D 1785, Schedule 80, polyvinyl chloride (PVC) plastic pipe with threaded ends; ASTM D 2464, Schedule 80, PVC plastic, threaded fittings; and threaded joints.

F. Flexible Polyethylene Pipe: Flexible poly (funny or swing pipe) can be installed only on heads with $\frac{3}{4}$ " or smaller inlets. Lengths cannot exceed 2' or 6 gpm.

G. Drain Piping: ASTM D 1485, Schedule 40, polyvinyl chloride (PVC) plastic pipe; ASTM D 2466, Schedule 40 PVC plastic, socket-type fittings; and solvent-cemented joints.

H. Sleeves: All sleeves shall be a minimum of 2" diameter. Sleeves shall be at least two sizes larger than the outside diameter of the piping contained in the sleeve.

1. ASTM D 1785, Schedule 40, polyvinyl chloride (PVC) plastic pipe; ASTM D 2466, Schedule 40, PVC plastic, socket-type fittings; and solvent-cemented joints.
2. All sleeves shall be marked by duct taping a "Deep~1" Sleeve Magnate on both ends of the sleeve at all locations.

3.5 CONTROL WIRES

A. All irrigation control wire shall bear approval as U.L.: type of underground feeder and each conductor shall be of electrical conductivity grade copper in accordance with ASTM-30. All control wire shall be specifically designed for direct burial use. Sizes shall be #14UF. A minimum loop of 24 inches shall be left at each valve, at each splice, and at each controller for expansion and/or servicing of the wire. All splices shall be water-tight, as specified above. All wire, crossing water, attached to bridges, going under paving, or where conditions require protection, shall be housed in conduit or sleeves, all out of ground conduits shall be metal rigid conduit. All buried conduit can be P.V.C. conduit.

B. Multiple wires in the same trenches shall be banded together at 10 foot intervals for protection. Where wires pass under paved areas, Schedule 40 P.V.C. sleeves shall be installed prior to installation of the paving, if possible, and prior to installation of the wires. Sleeves shall be sized as follows: 1 - 11 wires in 1-1/4 inch pipe; 12-15 wires in 1-1/2 inch pipe; etc

C. All common or ground wires shall be White. Where more than one controller is required, a different color hot wire shall be used for each controller. Two spare wires shall be run from each controller. Two spare wires shall be run from each controller to the farthest valve under its control in all directions and any valve which is on a dead-end line. The spares shall also be a different color from the regular wires and shall be labeled at both ends. Each spare wire shall be brought up to the surface in each valve box it passes through and coiled with 24 inches for use

in future connections. Each spare wire shall be tested for continuity prior to final acceptance of the project and guaranteed by the Contractor to be functional.

- D. The pigment or color of the wires shall be integrated into the covering, rather than painted on. No aluminum wire shall be used on this project!
- E. All control wires shall be installed in trenches 6 inches to either side of the pipe so that the wire is protected from damage during backfilling and maintenance operations. Control wires not placed in the trenches by the sides of the pipes, shall be buried 18 inches or deeper and marked on the "as built" drawings

3.6 JOINT CONSTRUCTION

- A. Flanged Joints: Align flanges and install gaskets. Assemble joints by sequencing bolt tightening. Use lubricant on bolt threads.
- B. Threaded Joints: Thread pipes with tapered pipe threads according to ASME B1.20.1, apply tape or joint compound, and apply wrench to valve ends into which pipes are being threaded.
- C. Polyvinyl Chloride (PVC) Piping Gasketed Joints: Construct joints between underground AWWA-type, cast-iron valves and NPS PVC pipe; with elastomeric seals that fit pipe diameter and valve ends; and lubricant, according to ASTM D 3139.
- D. Polyvinyl Chloride (PVC) Piping Solvent-Cemented Joints: Construction joints according to ASTM D 2672 and ASTM D 2855.
 - 1. Handling of Solvent Cements, Primers, and Cleaners: Comply with procedures in ASTM F 402 for safe handling when joining plastic pipe and fittings with solvent cements.
- E. All tees coming out of main lines or valves and other fixtures, shall be horizontal so that no weight or pressure may be exerted through the fixture on the top or bottom of the main line. Tees shall be Sch. 80 SXSXS with SXT Sch. 80 bushing of appropriate size to the valve and Sch. 40 SX tees for the head or heads. See detailed drawings.
- F. All tees coming out of the lateral lines for heads and other fixtures, shall be horizontal so that no direct weight or pressure may be exerted through the head to the top or bottom of the lateral line. Tees on lateral lines shall also be SXSXT to the head swing joints. See detailed drawings.

3.7 PIPING SYSTEMS – COMMON REQUIREMENTS

- A. General Locations and Arrangements: Drawings indicated general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, and in other design considerations. Install piping as indicated, except where deviations to layout are approved on coordination drawings.
- B. Install piping at a uniform slope of 6-inches per 100-feet (1:200) minimum, down to drain points.
- C. Install components having pressure rating equal to or greater than system operating pressure.
- D. Install piping free of sags and bends.
- E. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- F. Install fittings for changes in direction and branch connections.

G. Piping Connections: Except as otherwise indicated make piping connections as specified below.

1. Install unions, in piping 2-inches (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment having 2-inch (DN 50) or smaller threaded pipe connection.
2. Install flanges, in piping 2½-inches (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.
3. Install dielectric fittings to connect piping of dissimilar metals.

3.8 TRENCHES:

- A. Trenches shall be dug as wide and deep as necessary to properly place the sprinkling system according to the requirements herein. Any rock uncovered in this excavation shall not be left in the backfill. All excess rock shall be removed from the site by this Contractor and legally disposed of off the property. All trenches shall be backfilled and compacted to insure no settling of the surface, after the lawn is planted.
- B. If backfill soil is rocky or lumpy, protect the pipe and the pipe conduit with 8" of sand or loose, rock free, soil under, over and on sides of pipe. Avoid putting large rocks against pipe during backfilling operation. See detail.
- C. 18 to 30 inches of cover shall be placed over the top of all pipe and fittings on main lines (lines which maintain a constant water pressure).
- D. All trench bottom shall be sloped so that the pipes will gravity drain back to the main connection point or the nearest manual drain. If the existing main line is deeper than 30 inches, the Contractor shall install a riser to a depth of 18 to 30 inches and then install the new line at the required 18 – 30" depth. At no time will the mainline be installed deeper than 30" unless prior approval by Landscape Architect or Inspector.
- E. Trenches for lateral and supply lines (lines which carry water to the heads), shall be deep enough to maintain 8 to 14 inches of cover over the top of all pipe and fittings. Trenches shall also be deep enough to guarantee that all swing joints drain back to the lateral and supply lines. Lateral lines may be pulled by a mechanical puller provided all other applicable specifications are met.
- F. Trenches for lines supplying small head shall be deep enough to maintain a minimum of 8 to 16 inches of cover over the top of all pipe and fittings. Trenches for those lines shall be a minimum of 6 inches away from any walks, curbs, and of sufficient width to accommodate tees coming out sideways (horizontally) from the laterals. This also includes the other fittings which carry the small heads.
- G. Any rocks or other debris over one inch in diameter uncovered during excavation or trenching shall be removed from the area.
- H. If more than one line is required in a single trench, that trench shall be deep and wide enough to allow for at least 6 inches of separation, both vertically and horizontally between pipes.
- I. All trenches must be compacted to 90% in 6" lifts and watered in. Lines from control valves shall be installed after topsoil is in place and properly graded.
- J. This Contractor, in placing the sprinkling lines, etc., may uncover material not suitable for finished grading. This material shall be removed from the site by this Contractor. After the installation of the lines, the finished grading shall be smoothed over and restored to its original

condition, using additional topsoil at this Contractor's expense, if this is necessary. The upper 6" of topsoil removed in the excavation of trenches for pipeline shall be conserved and kept separate from subsoil and reinstalled without mixing with other soil.

- K. Trenches where more than one pipe is to be installed, a distance of 6" is to be maintained between each pipe. No exceptions.
- L. Trenches for, or with wiring shall be wiring shall be a minimum of 12" deep. Wiring shall be buried under pipe with a separation of no fewer than 3"
- M. All trenches are to be 12" away from all curbs, buildings and sidewalks. No exceptions.

3.8 PIPING INSTALLATION

- A. Install underground polyvinyl chloride (PVC) plastic pipe according to ASTM D 2774.
- B. Lay piping on solid sub-base, uniformly sloped without humps or depressions.
 - 1. Slope circuit piping down toward drain valve minimum of 1/2-inch in 10-feet (1:240).
 - 2. Install polyvinyl chloride (PVC) plastic pipe in dry weather when temperature is above 40°F (4°C). Allow joints to cure at least 24-hours at temperature above 40°F (4°C) before testing, unless otherwise recommended by manufacturer.
 - 3. Provide a minimum of 4" between parallel main and laterals and between parallel lateral lines for future maintenance. No exceptions.
- C. Drain Pockets: Excavate to sizes indicated. Backfill with cleaned gravel and crushed stone, graded from 3-inches (75 mm) to 3/4-inch (19mm) minimum, drain material to 12-inches (300 mm) below grade. Cover drain material with sheet of ASTM D 226, Type II, asphalt-saturated felt and backfill remainder with excavated material. Drain pocket to be minimum 6 cubic feet.
- D. Minimum Cover: Provide following minimum cover over top of buried piping:
 - 1. Pressure Piping: Greater depth of minimum of 18-inches (600 mm) below finished grade.
 - 2. Circuit Piping: 15-inches (380 mm).
 - 3. Drain Piping: 15-inches (380 mm).
 - 4. Sleeves: 18-inches (600 mm).
- E. Install piping under sidewalks and paving in sleeves.
- F. All glue joints to be set 24 hours prior to pressurization..

3.9 FLUSHING AND PRELIMINARY TESTING

- A. Flush and test each zone after installation of new piping, swing pipe and prefab swing joint, but before installation of heads and before backfilling is complete. Open control valve completely and flush with a full head of water. Each automatic valve shall then be disassembled, inspected for rocks, cleaned and re-assembled. Install heads and test each zone for coverage.
- B. Testing will be performed after completion of each circuit and again after the completion of the entire system. All repair work will be made at the contractor's expense.

3.9 VALVE APPLICATIONS

A. Quick Coupler Valve:

1. Each valve shall be a Rainbird 44 LRC heavy duty brass, two-piece single lug locking cap. Each valve shall also be teed off to supply line with at least 24 inches of galvanized iron pipe and all fittings from that point up shall be galvanized iron. A Ford B11444 heavy duty ball manual valve shall be installed upstream from each quick coupler or group of quick couplers on one supply line for water shut-off and maintenance.
2. Quick coupler valves shall be installed within a 10" round Brooks Box unless next to concrete pad, then installed to grade.
3. The Contractor shall provide to the Landscape Architect at least 1 cap lock key and 1 quick coupling key with a swivel hose bib attached. These keys shall be delivered prior to final acceptance of the project.

B. Gate Valves – Metered Side

1. Gate Valves shall conform to AWWA specifications C 409. They shall be of Class 200 cast iron body. Resilient-seated Gate Valve and shall have a non-rising stem with rubber "O" rings. Stems shall be of cold rolled solid bronze, high tensile strength. Valve shall be high strength cast iron, fully encapsulated urethane rubber wedge. Gate valves shall be hydrostatically pressure tested for 400 PSI and shall be designated for a working pressure of 200 PSI shall be American made- waterous brand.
2. Valve Sized 3" and larger shall have flanged end connections. Valves 2-1/2" and smaller shall have threaded end connection i.e. non-rising stem. Buried valves shall have 2" square operating nuts. No handles or sheels will be permitted. Valves inside structures shall have wheel handles. Unions shall be installed in each side of all valves except flanged valves. Each valve shall contain a resilient wedge urethane rubber seat.

C. Control Valves:

1. Each valve shall be metal globe diaphragm and electrically activated. No valve shall be installed more than 12 inches below finished grade. All pipe on the control valve manifolds shall be Schedule 80 P.V.C pipe.

D. Manual Drain Valves:

1. Manual drain valves shall be required at all low points in the main lines.
2. All manual drains shall be Ford B11333 heavy duty brass, ball valves.
3. The location of each manual drain shall be shown on the "as built" drawing with dimensions from the nearest permanent fixture, such as a building corner, etc....
4. Each manual drain valve will be access by a 2 inch P.V.C Schedule 40 pipe sleeve, capped by a Weathermatic 906L locking valve cap with a RLK-1 key, no approved equals, enclosed within a 10" round Brooks Bolt down box – top of drain sleeve to be 3" – 6" below lids of Brooks Box.
5. Each manual drain shall empty into a grave sump, a minimum of 18 inches by 18 inches by 12 inches deep. The gravel shall be washed ¾ inch rock. No pea gravel will be allowed.

E. Automatic Drain Vales

1. Automatic drain valves shall not be used.

F. Drawings indicate valve types to be used. Where specific valve types are not indicated, following requirements apply:

1. Buried Valves 3-inches (DN 80) and Larger: AWWA, gate valves, non-rising stem, with stem nut and valve box.
2. Buried Valves 2-inches (DN 50) and Smaller: Bronze-body, curb stop, with tee head, service box and shutoff rod.

3.10 VALVE INSTALLATION

A. Valves: Install underground valves in valve boxes or pits.

1. Install valves and SCH 80 polyvinyl chloride (PVC) pipe with restrained, gasketed joints.
2. Do not install at low spots.
3. Install all valves with SCH 80 PVC pipe running through the manifold. SCH 80 PVC to extend to the outside edge of the valve box on each side.

B. Curb Stops: Install underground curb stops in service boxes.

C. Control and Ball Valves: Install in valve control valve boxes, arranged for easy adjustment and removal. Install unions with one (1) on upstream side at each valve manifold.

3.11 SPRINKLER INSTALLATION

A. Sprinklers: Flush circuit piping with full head of water and install sprinklers after hydrostatic test is complete.

1. Install lawn sprinklers at manufacturer's recommended heights.
2. Install shrubbery sprinklers at heights indicated.
3. Locate part-circle sprinklers to maintain a minimum distance of 12-inches (400 mm) from walls and 2-inches (50 mm) from other boundaries, unless otherwise indicated.

B. All heads shall be installed above grade so as to minimize washing of the topsoil and seed during the landscaping establishment period, except those which border paving or flat work of any kind. These heads shall be installed at the finished grade of the adjacent paving or flat work. Prior to final acceptance of the project, all heads shall be raised or lowered to final lawn or planting grade.

C. Heads installed in existing sod shall be set at the grade of the soil.

D. All rotary pop-up heads shall be installed at a final grade on double swing joints. See detailed drawings in the section following this one. All swing joints must drain by gravity back to the supply lines.

E. All pop-up, shrub spray, lawn spray, bubbler and strip spray heads shall be installed as shown in the details.

- F. All pipes, lines, and risers shall be flushed thoroughly with water before installation of any heads. All debris and rocks found at that time shall be removed from the area as soon as possible.

3.12 AUTOMATIC CONTROL SYSTEM INSTALLATION

- A. Install controllers according to manufacturer's written instructions and as indicated.
- B. Install controllers on Unistrut or similar mounting system. Attach to wall where shown. Provide and install wire gutter for wiring connections at controller.
- C. Run one extra wire from the adjacent controller to each group of valves for future use and stub into the valve box.
- D. Install control wiring in same trench with piping.

3.13 CONNECTIONS

- A. Connect piping to sprinklers, devices, valves, control valves, specialties, and accessories.
- B. Connect water supplies to irrigation systems. Include backflow preventers on potable water supplies. Include automatic filters on secondary water supplies.
- C. Electrical Connections: Connect to power source, controllers, and automatic control valves.
- D. Minimum requirements for electrical installations are specified in Division 16.
- E. Ground systems according to Division 16 Section "Grounding."

3.14 FIELD QUALITY CONTROL

- A. Testing: Perform hydrostatic test of piping and valves before backfilling trenches. Piping may be tested in sections to expedite work.
 - 1. Cap and subject the piping system to a static water pressure of 50 psig (345 kPa) above the operating pressure without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for 4-hours. Leaks and loss in test pressure constitute defects that must be repaired.
 - 2. Repair leaks and defects with new materials and retest system or portion thereof until satisfactory results are obtained.
 - 3. Notify Architect 24 hour in advance of pressure testing so test may be observed.

3.15 CLEANING AND ADJUSTING

- A. Flush dirt and debris from piping before installing sprinklers and other devices.
- B. Adjust automatic control valves to provide flow rate of rated operating pressure required for each sprinkler circuit.
- C. Carefully adjust lawn sprinklers so they will be flush with, or not more than ½-inch (13 mm) above, finish grade after completion of landscape work.

- D. Adjust settings of controllers and automatic control valves.

3.16 COMMISSIONING

- A. Starting Procedures: Follow manufacturer's written procedures. If no procedures are prescribed by manufacturers, proceed as follows:
 - 1. Verify that specialty vales and their accessories have been installed correctly and operate correctly.
 - 2. Verify that specified test of piping are complete.
 - 3. Check that sprinklers and devices are correct type.
 - 4. Check that damaged sprinklers and devices have been replaced with new materials.
 - 5. Check that potable water supplies have correct type backflow preventers.
 - 6. Energize circuits to electrical equipment and devices.
 - 7. Adjust operating controls.
- B. Operational Testing: Perform operational testing after hydrostatic testing is completed, backfill is in place, and sprinklers are adjusted to final position.
- C. Provide Irrigation System Water Audit and adjust heads and nozzles as directed by the Auditor prior to final acceptance.
- D. Provide irrigation system layout and diagram in CADD format with water zones clearly identified. Layout to be color coded with a maximum of 5 colors for easy legibility. Record water budget for each irrigation control zone and current settings. Provide laminated copy and mount near controller. Verify location with Architect.

3.17 DEMONSTRATION

- A. Demonstrate to Architect that system meets coverage requirements and that automatic controls function properly.
- B. Demonstrate to Owner's maintenance personnel operation of equipment, sprinklers, specialties, and accessories. Review operating and maintenance information.
- C. Provide 7-days' written notice in advance of demonstration.
- D. System Operation Test / Substantial Completion Inspection:
 - 1. During the Substantial Completion Inspection, the entire system, both electric and hydraulic, will be tested in the presence of the Landscape Architect and the Owners Representative to insure COMPLETE coverage of all areas to be watered. Any deficiencies identified at this time will require revisions by the Contractor at the Contractor's expense.

3.18 WINTERIZATION

- A. All irrigation systems are winterized on or around October 15th. If the Substantial Completion Certificate has not been issued by this date, it will be the responsibility of the Contractor to winterize the system. All work shall be coordinated with and at the direction of the Owner to winterize the system. The Contractor shall be responsible to activate the system in the Spring to insure there are no problems. Start up and Shut down will be completed in the presence of the Grounds department Personnel. No Exceptions.

APPENDIX A
 ALLOWABLE AVERAGE DISTANCES FROM CONTROLLER TO VALVES

Wire Sizes			8 WATT NO. 50 AND 150 22" - 3" NUMBER OF VALVES				7 WATT NO. 150 SERIES NUMBER OF VALVES				3.5 WATT NO. 50 / 150 NUMBER OF VALVES				3.1 WATT NO. 1825 / 1830 SERIES NUMBER OF VALVES			
L	o	a	1 2 3 4				1 2 3 4				1 2 3 4				1 2 3 4			
105V	16	16	1,440	720	480	360	1,630	810	540	400	4,950	2,470	1,650	1,230	3,050	1,520	1,010	760
	16	14	1,770	880	590	440	2,000	1,000	660	500	6,070	3,030	2,020	1,510	3,750	1,870	1,250	930
	16	12	2,070	1,030	690	510	2,340	1,170	780	580	7,090	3,540	2,360	1,770	4,370	2,180	1,450	1,090
	14	14	2,295	1,140	760	570	2,590	1,290	860	640	7,850	3,920	2,610	1,960	4,840	2,420	1,450	1,210
	14	12	2,820	1,410	930	700	3,190	1,590	1,060	790	9,640	4,820	3,210	2,410	5,950	2,970	1,980	1,480
	12	10	3,295	1,640	1,095	820	3,720	1,860	1,230	930	11,250	5,620	3,740	2,810	6,940	3,470	2,310	1,730
	12	12	3,660	1,830	1,215	910	4,130	2,060	1,370	1,030	12,500	6,250	4,160	3,120	7,710	3,850	2,560	1,920
	12	10	4,490	2,240	1,490	1,120	5,070	2,530	1,680	1,260	15,340	7,670	5,100	3,830	9,470	4,730	3,150	2,360
	10	10	5,810	2,900	1,930	1,450	6,560	3,280	2,160	1,640	19,860	9,930	6,610	4,960	12,600	6,130	4,080	3,060
	10	8	7,140	3,570	2,370	1,780	8,060	4,030	2,650	2,010	24,390	12,190	8,120	6,090	15,050	7,520	5,010	3,760
110V	16	16	1,670	830	550	410	1,910	950	630	470	5,400	2,700	1,800	1,350	2,360	1,180	780	590
	16	14	2,050	1,020	680	510	2,350	1,170	780	580	6,630	3,310	2,210	1,650	4,160	2,080	1,380	1,040
	16	12	2,400	1,200	800	600	2,740	1,370	910	680	7,740	3,870	2,580	1,930	4,860	2,430	1,620	1,210
	14	14	2,660	1,330	880	660	3,040	1,520	1,010	760	8,570	4,280	2,850	2,140	5,380	2,690	1,790	1,340
	14	12	3,260	1,630	1,080	810	3,730	1,860	1,240	930	10,500	5,250	3,500	2,620	6,610	3,300	2,200	1,650
	14	10	3,810	1,900	1,270	950	4,350	2,170	1,450	1,080	12,280	6,140	4,090	3,070	7,710	3,850	2,570	1,920
	12	12	4,230	2,110	1,410	1,050	4,830	2,410	1,610	1,200	13,840	6,820	4,540	3,400	8,570	4,280	2,850	2,140
	12	10	5,190	2,590	1,730	1,290	5,930	2,960	1,970	1,480	16,750	8,370	5,580	4,180	10,520	5,260	3,500	2,630
	10	10	6,720	3,360	2,240	1,680	7,660	3,830	2,550	1,910	21,680	10,800	7,220	5,420	13,620	6,810	4,540	3,400
	10	8	8,260	4,130	2,750	2,010	9,420	4,710	3,140	2,350	26,620	13,300	8,870	6,650	16,720	8,360	5,570	4,180
115V	16	16	1,960	980	650	490	2,260	1,130	750	560	5,980	2,990	1,990	1,490	3,900	1,950	1,300	970
	16	14	2,410	1,200	800	600	2,780	1,390	920	690	7,340	3,670	2,440	1,830	4,790	2,390	1,590	1,190
	16	12	2,810	1,400	930	700	3,240	1,620	1,080	810	8,570	4,280	2,850	2,140	5,590	2,790	1,860	1,390
	14	14	3,120	1,560	1,030	780	3,590	1,790	1,190	890	9,480	4,740	3,150	2,370	6,180	3,090	2,050	1,540
	14	12	3,830	1,910	1,270	950	4,410	2,200	1,470	1,100	11,650	5,820	3,880	2,910	7,800	3,800	2,530	1,900
	14	10	4,470	2,230	1,480	1,110	5,150	2,520	1,710	1,280	13,600	6,800	4,520	3,400	8,870	4,430	2,950	2,210
	12	12	4,960	2,480	1,650	1,240	5,720	2,860	1,900	1,430	15,100	7,550	5,020	3,770	9,860	4,930	3,280	2,460
	12	10	6,690	3,040	2,020	1,520	7,020	3,510	2,330	1,750	18,540	9,270	6,170	4,630	12,100	6,050	4,030	3,020
	10	10	7,890	3,940	2,620	1,970	9,090	4,540	3,020	2,270	24,000	12,000	7,990	6,000	15,660	7,830	5,210	3,910
	10	8	9,690	4,840	3,220	2,420	11,160	5,580	3,710	2,790	29,470	14,730	9,810	7,360	19,230	9,610	6,400	4,800
120V	16	16	2,170	1,080	720	540	2,510	1,250	830	620	6,394	3,190	2,130	1,590	4,240	2,120	1,410	1,060
	16	14	2,660	1,330	880	660	3,090	1,540	1,030	770	7,850	3,920	2,710	1,960	5,200	2,600	1,730	1,300
	16	12	3,110	1,550	1,030	770	3,600	1,800	1,200	900	9,170	4,580	3,050	2,290	6,070	3,030	2,020	1,510
	14	14	3,440	1,720	1,140	860	4,000	2,000	1,330	1,000	10,140	5,070	3,380	2,530	6,720	3,360	2,240	1,680
	14	12	4,230	2,110	1,410	1,050	4,900	2,450	1,630	1,220	12,450	6,220	4,150	3,110	8,260	4,130	2,750	2,060
	14	10	4,940	2,470	1,640	1,230	5,720	2,860	1,900	1,430	14,540	7,270	4,840	3,630	9,640	4,820	3,210	2,410
	12	12	5,490	2,740	1,830	1,370	6,360	3,180	2,120	1,590	16,140	8,070	5,380	4,030	10,720	5,360	3,570	2,680
	12	10	6,730	3,360	2,240	1,680	7,800	3,900	2,600	1,950	19,820	9,910	6,600	4,950	13,150	6,570	4,380	3,280
	10	10	8,720	4,360	2,900	2,180	10,100	5,050	3,360	2,520	25,660	12,830	8,550	6,410	17,020	8,510	5,670	4,250
	10	8	10,710	5,350	3,570	2,670	12,400	6,200	4,130	3,100	31,500	15,750	10,500	7,870	20,900	10,450	6,960	5,220
125V	16	16	2,380	1,190	790	590	2,770	1,380	920	690	5,980	2,990	1,990	1,490	4,750	2,370	1,580	1,180
	16	14	2,920	1,460	970	730	3,400	1,700	1,130	850	7,340	3,670	2,440	1,830	5,830	2,910	1,940	1,450
	16	12	3,410	1,700	1,130	850	3,970	1,980	1,320	990	8,570	4,280	2,850	2,140	6,800	3,400	2,260	1,700
	14	14	3,720	1,880	1,250	940	4,390	2,190	1,460	1,090	10,790	5,390	3,590	2,690	7,530	3,760	2,500	1,880
	14	12	4,640	2,320	1,540	1,160	5,400	2,700	1,790	1,350	13,260	6,630	4,410	3,310	9,250	4,620	3,080	2,310
	14	10	5,410	2,700	1,800	1,350	6,300	3,150	2,090	1,570	15,470	7,730	5,150	3,860	10,800	5,400	3,590	2,700
	12	12	6,010	3,000	2,000	1,500	6,990	3,490	2,320	1,740	17,180	8,590	5,720	4,290	12,000	6,000	3,990	3,000
	12	10	7,380	3,690	2,455	1,840	8,580	4,290	2,850	2,140	21,090	10,540	7,020	5,270	14,730	7,360	4,900	3,680
	10	10	9,550	4,770	3,180	2,380	11,110	5,550	3,690	2,770	27,310	13,650	9,090	6,820	19,070	9,530	6,350	4,760
	10	8	11,730	5,860	3,905	2,430	13,640	6,820	4,540	3,410	33,530	16,760	11,160	8,380	23,410	11,700	7,790	5,850

END OF SECTION 328400

SECTION 328401 – DRIP IRRIGATION 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 valves, piping, drip tube, sprinklers, specialties and accessories for drip irrigation systems. This section does not override any of the requirements of section 0328400.
- B. Field verify capacity of the existing new secondary well system complete including but not limited to flow, capacity, controller operation and etc.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section 011000 Summary.
 - 2. Specification Section – Soils Report for reference only.
 - 3. Division 32 Section Landscape Planting.
 - 4. Division 32 Section Irrigation Sprinkling System.

1.3 DEFINITIONS

- A. Piping sizes used in this Section are normal pipe size (NPS) in inches. Tube sizes are standard size in inches. Equivalent SI (metric) sizes are indicated in millimeters (mm) in parentheses.
- B. Supply Piping: Piping from water source to connection to irrigation system pressure piping. Piping is under same pressure as water supply. Piping in this category is not included in this Section.
- C. Pressure Piping: Piping downstream from supply piping to and including control valves. Piping is under irrigation system pressure. Piping in this category includes pressure regulators, water meters, and backflow preventers, when used.
- D. Circuit Piping: Piping downstream from control valves to irrigation system sprinklers, emitters, devices, and drain valves. Piping is under pressure (less than pressure piping) during flow.
- E. Control Valve: Manual or automatic (electrically operated) valve for control water flow to irrigation system zone, including isolation or zone valves.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. Location of Drip line, Emitters and Devices: Design location is approximate. Make minor adjustments necessary to avoid planting and obstructions such as signs and light standards.

1.5 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data including pressure rating, rated capacity, settings, and electrical data of selected models for the following:
 - 1. Dripper line.
 - 2. Pressure regulators.
 - 3. Valves, including general-duty, underground, manual and automatic control, and quick-coupler types, and valve boxes.
 - 4. Sprinklers and devices.
 - 5. Flush Valves.
 - 6. Filters.
 - 7. Air/Vacuum Relief Valves
 - 8. Pipe, including sleeves, lateral, supply, conduit and drain.
- C. Maintenance data for inclusion in "Operating and Maintenance Manual" specified in Division 1 Section "Project Closeout" for the following:
 - 1. Dripper line.
 - 2. Pressure regulators.
 - 3. Valves, including general-duty, underground, manual and automatic control, and quick-coupler types, and valve boxes.
 - 4. Sprinklers and devices.
 - 5. Flush Valves.
 - 6. Filters.
 - 7. Air/Vacuum Relief Valves
 - 8. Pipe, including sleeves, lateral, supply, conduit and drain.

1.6 QUALITY ASSURANCE

- A. Comply with requirements of utility supplying water for prevention of backflow and backsiphonage.
- B. Comply with requirements of authority with jurisdiction for irrigation systems.
- C. Installer Qualifications: Engage an experienced installer who has completed minimum of 6 irrigation systems similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.
- D. Electrical Components, Devices and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Irrigation Components, Devices and Accessories: Listing, Label, or Other Marking: The manufacturer's markings and labels to be clearly stamped on all equipment, specialties, and accessories made to specified standards.
- F. Product Options: Irrigation system piping, specialties, and accessories are based on specific types, manufacturers, and models indicated. Components with equal performance

characteristics produced by other manufacturers may be considered, provided deviations in dimensions, operation, and other characteristics do not change design concept or intended performance as judged by the Architect, unless noted "No Substitute". The burden of proof of product equality is on the Contractor. Refer to Division 1 Section "Product Substitutions." No requests for substitutions will be reviewed after bids have been received by Owner.

1.7 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Verify that irrigation system piping may be installed in compliance with original design and referenced standards.
- B. Site Information: Reports on subsurface condition investigations made during design of the Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions (between soil borings). Owner assumes no responsibility for interpretations or conclusions drawn from this information.

1.8 SEQUENCING AND SCHEDULING

- A. Maintain uninterrupted water service to building during normal working hours. Arrange for temporary water shutoff with Owner.
- B. Coordinate irrigation systems work with landscape work specified in Division 32 Section 328300 – Landscape Planting.

1.9 EXTRA MATERIALS

- A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below. Package them with protective covering for storage and label clearly describing contents.

- 1. Dripper Tube: Furnish quantity of units equal to 10% of amount of each type installed.

1.10 WARRANTY/GUARANTEE

- A. During the period of one (1) year from and after the final acceptance of the completed irrigation system, the Contractor shall at his own expense, make all needed repairs or replacement due to defective workmanship or materials which in the judgment of the Owner or Owner's representative, shall become necessary during such period. If, within seven (7) calendar days after mailing of the written notice or verified communication by the Owner to the Contractor or his agent, requesting such repairs or replacement, the Contractor shall neglect to make repairs, Owner may make such repairs at the Contractor's expense. In the case of emergency where, in the judgment of the Owner, delay could cause serious loss, hazard or damage to persons or property, then repairs, replacement and security, both temporary and/or permanent, may be provided by such persons as the Owner may employ, after verbal communication with Contractor without notice being sent to the Contractor, and the Contractor shall pay all costs related thereto.
- B. The guarantee shall be in the form of a letter from the Contractor addressed to the Owner. The letter shall incorporate the language stated above and be signed by an authorized officer/agent or Owner of the Contractor.

- C. During the guarantee period, the Contractor will drain the system in the fall and put the system back into operation in the spring. This work shall be done in the presence of the Owner's representative and maintenance personnel.

1.11 RECORD DRAWINGS:

- A. Any deviation from plan layout should be indicated on the final "Record" Drawings. This Contractor shall make an exact measured and dimensioned drawing showing locations of all piping, wiring, control, valves and quick coupler valves.
- B. Record Drawings shall be furnished to the Landscape Architect at the time of Substantial Completion Inspection before a letter of Substantial Completion for the irrigation sprinkler system will be issued.
- C. The Contractor shall supply the Landscape Architect with record drawing information in AutoCAD format before final acceptance of the irrigation system.

1.12 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver irrigation system components in manufacturer's original undamaged and unopened containers with labels intact and legible.
- B. Deliver plastic piping in bundles, packaged to provide adequate protection of pipe ends, both threaded or plain.
- C. Store and handle materials to prevent damage and deterioration.
- D. Provide secure, locked storage for valves, sprinkler heads, and similar components that cannot be immediately replaced, to prevent installation delays.

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 the following, or equal.

Manufacturers:

1. Pressure Regulators
 - a. Rain Bird Sprinkler Mfg. Corp.
 - b. Netafim USA
2. Drip Tube
 - a. Hunter Industries
 - b. Rain Bird Sprinkler Mfg. Corp.
 - c. Netafim USA
3. Sprinklers
 - a. Hunter Industries
 - b. Rain Bird Sprinkler Mfg. Corp.
 - c. Toro Company

4. Filters
 - a. Hunter Industries
 - b. Rain Bird Sprinkler Mfg. Corp.
 - c. Netafim USA.
5. Flush Valves
 - a. Hunter Industries
 - b. Rain Bird Sprinkler Mfg. Corp.
 - c. Netafim USA.
6. Air/Vacuum Relief Valves
 - a. Hunter Industries
 - b. Rain Bird Sprinkler Mfg. Corp.
 - c. Netafim USA.
7. Pipe
 - a. Pacific Western Extruded Plastics Co.
 - b. Eagle Pacific Industries, Inc.
 - c. J-M Manufacturing Company, Inc.

2.2 PIPES AND TUBES

- A. Refer to Part 3 Article "Piping Applications" for identification of systems where pipe and tube materials specified below are used.
- B. Polyvinyl Chloride (PVC) Plastic Pipe: ASTM D 1785, PVC 1120, Schedule 40, 160 psig (1100 kPa) minimum pressure rating for 4-inch (100-mm) and smaller sizes, with plain, threaded or bell ends.

2.3 PIPE AND TUBE FITTINGS

- A. Refer to Part 3 Article "Piping Applications" for identification of systems where pipe and tube fitting materials specified below are used.
- B. Polyvinyl Chloride (PVC) Plastic Pipe Fittings: ASTM D2467, Schedule 40, socket-type and ASTM D2464, Schedule 40, threaded fittings.
- C. Polyvinyl Chloride (PVC) Plastic Pipe Fittings: ASTM D2467, Schedule 40, socket-type.

2.4 JOINING MATERIALS

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for joining materials not included in this Section.
- B. Solvent Cement: ASTM F656 primer and ASTM D2564 solvent cement in color other than orange.
- C. 17 mm. Barb Fittings: Connections shall be made with drip tube manufacturer approved fittings.

2.5 VALVES

- A. General: Valves are for general-duty and underground applications. Refer to "Valve Applications" Article for locations of various valve types specified in this Article. Refer to "Control Valves" Article for control valves and accessories and "Backflow Preventers" Article for backflow preventer valves.
- B. Plastic Valves: Polyvinyl Chloride (PVC) Plastic, with 150 psig (1035 kPa) minimum pressure rating, ends compatible to piping where valve is to be installed, and tee handle.
- C. Ball Valves: Ball valves shall be solid bronze meeting Federal Specification WW-V-35C, TYPE II, COMPOSITION: BZ, STYLE: 3. Size shall be the same size as the main line on which it is installed. Valves shall be installed on the up-stream side of the electric remote control valve manifold and in the same valve box. NOTE: Only one (1) ball valve required per manifold.

2.6 CONTROL VALVES

- A. Description: Manufacturer's standard control valves for circuits, of type and size indicated, and as follows:
 - 1. Provide cast-bronze bodies, unless otherwise indicated.
 - 2. Manual Control Valves: MSS SP-80, Class 125, globe valves.
 - 3. Key-Operated, Manual Control Valves: MSS Sp-80, Class 125, globe valves, fitted for key operation.
 - 4. Automatic Control Valves: Diaphragm-type, normally closed, with manual flow adjustment, and operated by 24-volt-a.c. solenoid.
 - 5. Hose Bibbs: Factory-fabricated assembly. Include coupler water-seal valve. Threads for garden hose on outlet; hose bibb to be in upright position.
- B. Control Valve boxes: Polyethylene (PE), acrylonitrile-butadiene-styrene (ABS), fiberglass, polymer concrete, or precast concrete box and cover. Size as required for application.
 - 1. Drainage Backfill: Cleaned gravel or crushed stone, graded from 3-inches (75 mm) maximum to ¾-inch (19 mm) minimum.
 - 2. Valve boxes shall be of sufficient size to house two (2) electric remote control valves with unions, and still allow room for maintenance without having to excavate or perform similar operations. Boxes shall have lock down lids and shall meet ASTM D638 for tensile strength of 4,300 pounds per square inch.

2.7 SPRINKLERS

- A. Description: Manufacturer's standard sprinklers designed to provide uniform coverage over entire area of spray shown on Drawings at available water pressure, as follows:
 - 1. Pop-up, Spray: Fixed pattern, with screw-type flow adjustment and stainless steel retraction spring.

2.8 DRIP LINE AND INTEGRAL DRIPPER LINE COMPONENTS

- A. The dripper line shall be pressure compensating dripper line 17mm. Dripper flow rate spacing shall be as indicated on drawings.
 - 1. 17mm fittings: All dripline connections shall be made with manufacturer approved insert fittings.
 - 2. Soil Staples: All on-surface/under mulch dripline installations shall be held in place with soil staples spaced evenly every 3' to 5' on center, and with two staples on each change of location.
 - 3. Pressure Regulator: A pressure regulator shall be installed at each zone valve or on the main line to ensure operating pressures do not exceed system requirements. Provide low flow pressure regulator for inline applications under 5 gpm and high flow regulators for flows up to 17.5 gpm.
 - 4. Disc Filter: A disc filter shall be installed at each zone valve or on the main line to ensure proper filtration. The filter shall be as indicated on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Investigate and determine available water supply, water pressure and flow characteristics.

3.2 PIPING APPLICATIONS

- A. Refer to Part 2 of this Section for detailed specifications for pipe and fittings products listed below. Use pipe, tube, fittings, and joining methods according to the following applications. Piping in pits and aboveground may be joined with flanges instead of joints indicated.
- B. Use pipe, tube, fittings, and joining methods according to the manufacturer's specification and the following applications.
- C. Circuit Piping: Use the following:
 - 1. 3-inches (DN 80) and Smaller: ASTM D 2241, SDR 17, polyvinyl chloride (PVC) plastic pipe; ASTM D 2467, Schedule 40, PVC plastic, socket-type pipe fittings; and solvent-cemented joints.
- D. Branches and Offsets at Sprinkler and Devices: ASTM D 1785, Schedule 80, polyvinyl chloride (PVC) plastic pipe with threaded ends; ASTM D 2464, Schedule 80, PVC plastic, threaded fittings; and threaded joints.
- E. Sleeves: ASTM D 1785, Schedule 40, polyvinyl chloride (PVC) plastic pipe; ASTM D 2466, Schedule 40, PVC plastic, socket-type fittings; and solvent-cemented joints.

3.3 JOINT CONSTRUCTION

- A. Polyvinyl Chloride (PVC) Piping Solvent-Cemented Joints: Construction joints according to ASTM D 2672 and ASTM D 2855.
 - 1. Handling of Solvent Cements, Primers, and Cleaners: Comply with procedures in ASTM F 402 for safe handling when joining plastic pipe and fittings with solvent cements.

3.4 PIPING SYSTEMS – COMMON REQUIREMENTS

- A. General Locations and Arrangements: Drawings indicated general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, and in other design considerations. Install piping as indicated, except where deviations to layout are approved on coordination drawings.
- B. Install piping at a uniform slope of 6-inches per 100-feet (1:200) minimum, down to drain points.
- C. Install components having pressure rating equal to or greater than system operating pressure.
- D. Install piping free of sags and bends.
- E. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- F. Install fittings for changes in direction and branch connections.
- G. Piping Connections: Except as otherwise indicated make piping connections as specified below.
 - 1. Install unions, in piping 2-inches (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment having 2-inch (DN 50) or smaller threaded pipe connection.

3.5 TRENCHES:

- A. Trenches shall be dug as wide and deep as necessary to properly place the sprinkling system according to the requirements herein. Any rock uncovered in this excavation shall not be left in the backfill. All excess rock shall be removed from the site by this Contractor and legally disposed of off the property. All trenches shall be backfilled and compacted to insure no settling of the surface, after the lawn is planted.
- B. If backfill soil is rocky or lumpy, protect the pipe and the pipe conduit with 8" of sand or loose, rock free, soil under, over and on sides of pipe. Avoid putting large rocks against pipe during backfilling operation.
- C. All trenches must be compacted to 90% in 6" lifts and watered in. Lines from control valves shall be installed after topsoil is in place and properly graded.
- D. This Contractor, in placing the sprinkling lines, etc., may uncover material not suitable for finished grading. This material shall be removed from the site by this Contractor. After the installation of the lines, the finished grading shall be smoothed over and restored to its original condition, using additional topsoil at this Contractor's expense, if this is necessary. The upper 6" of topsoil removed in the excavation of trenches for pipeline shall be conserved and kept separate from subsoil and reinstalled without mixing with other soil.
- E. Trenches where more than one pipe is to be installed, a distance of 6" is to be maintained between each pipe.
- F. All trenches are to be 12" away from all curbs, buildings and sidewalks. No exceptions.

3.6 PIPING INSTALLATION

- A. Install underground polyvinyl chloride (PVC) plastic pipe according to ASTM D 2774.

- B. Lay piping on solid sub-base, uniformly sloped without humps or depressions.
 - 1. Slope circuit piping down toward drain valve minimum of ½-inch in 10-feet (1:240).
 - 2. Install polyvinyl chloride (PVC) plastic pipe in dry weather when temperature is above 40 deg. F (4 deg. C). Allow joints to cure at least 24-hours at temperature above 40 deg. F (4 deg. C) before testing, unless otherwise recommended by manufacturer.
- C. Minimum Cover: Provide following minimum cover over top of buried piping:
 - 1. Lateral Line Piping: 16".
 - 2. Main Line Pipe: 24"
 - 3. Inline Emitter Tubing: 2"
- D. Install piping under sidewalks and paving in sleeves.

3.7 DRIP LINE INSTALLATION

- A. Install all drip line as indicated on drawings. Use only Teflon tape on all threaded connections.
- B. When installing drip line on-surface, install soil staples as listed below:
 - 1. Sand Soil: One staple every three (3') feet and two (2) staples on each change of direction (tee, elbow, or cross).
 - 2. Loam Soil: One staple every four (4') and two (2') staples on each change of direction (tee, elbow or cross).
 - 3. Clay Soil: One staple every five (5') feet and two (2') staples on each change of direction (tee, elbow or cross).
- C. Cap or plug all openings as soon as lines have been installed to prevent the entrance of materials that would obstruct the pipe. Leave in place until removal is necessary for completion of installation.
- D. Install two operation flags or 12" pop up heads as indicators per each drip line valve. Pop up heads and/or operation flags shall be used to notify and indicate operation of the drip system.
- E. Thoroughly flush all water lines before installing valves, emitters and other hydrants.
- F. Test in accordance with Manufacturers recommendations.

3.8 VALVE INSTALLATION

- A. Valves: Install underground valves in valve boxes or pits.
 - 1. Install valves and polyvinyl chloride (PVC) pipe with restrained, gasketed joints.
- B. Control and Ball Valves: Install in valve control valve boxes. All of the devices in the manifold shall be space such that all of the devices are fully operational and accessible for maintenance purposes. Manifold shall include the following devices, in this order:
 - 1. Brass Isolation Valve

2. Automatic valve of the appropriate size.
3. Manifold union.
4. Disc filter with 140 mesh disc filter rings, of appropriate size
5. Inline pressure regulator valve of appropriate size and flow.
6. Manifold union.

3.9 SPRINKLER INSTALLATION

- A. Sprinklers: Flush circuit piping with full head of water and install sprinklers after hydrostatic test is complete.
 1. Install all pop up indicator heads on the drip system per manufacturer's recommendations.
 2. Locate 12" pop up sprinklers a minimum distance of 12-inches (400 mm) from walls and 2-inches (50 mm) from other boundaries, unless otherwise indicated.

3.10 DRAINS:

- A. All lines shall be sloped to drain. A minimum of drains should be used. Extra drain valves necessitated by unforeseen field conditions to make the system drain shall be provided by the Contractor and approved by the Landscape Architect.
- B. A suitable gravel sump shall be provided for each drain, minimum of 6" below the finished grade. A sump shall be a 24" diameter hole filled with gravel 2" above and 12" below the drain.

3.11 DRIP FILTERS:

- A. Filters shall be installed immediately after the electric valve and before the pressure regulator. The main body of the filter shall be installed at a slight downward angle so the dirt and debris will collect in the removable cap. An appropriate valve box shall be used to insure easy access to the filter for cleaning purpose.

3.12 DRIP SYSTEM PRESSURE REGULATORS:

- A. The regulators shall be installed after the filters and must be accessible in appropriate valve boxes for inspections and maintenance.

3.13 MANUAL FLUSH VALVES:

- A. These valves serve to provide flushing during installation and in case of major breaks or contaminations in the system. They shall be installed one for at each dead end and low point in the system. Line flush valves shall be placed in a 10 round box, stabilized on brick and with a 12" gravel sump below each valve.

3.14 FIELD QUALITY CONTROL

- A. Testing: Perform hydrostatic test of piping and valves before backfilling trenches. Piping may be tested in sections to expedite work.
 - 1. Cap and subject the piping system to a static water pressure of 50 psig (345 kPa) above the operating pressure, but not less than 150 psig without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for 4-hours. Leaks and loss in test pressure constitute defects that must be repaired.
 - 2. Repair leaks and defects with new materials and retest system or portion thereof until satisfactory results are obtained.
 - 3. Notify Architect and University Landscape Maintenance Department Representative 24 hours in advance of pressure testing so test may be observed.

3.15 CLEANING AND ADJUSTING

- A. Flush dirt and debris from piping before installing sprinklers and other devices.
- B. Adjust automatic control valves to provide flow rate of rated operating pressure required for each sprinkler circuit.

3.16 COMMISSIONING

- A. Starting Procedures: Follow manufacturer's written procedures. If no procedures are prescribed by manufacturers, proceed as follows:
 - 1. Verify that specialty vales and their accessories have been installed correctly and operate correctly.
 - 2. Verify that specified test of piping are complete.
 - 3. Check that sprinklers and devices are correct type.
 - 4. Check that damaged drip tube, emitters and devices have been replaced with new materials.
 - 5. Energize circuits to electrical equipment and devices.
 - 6. Adjust operating controls.
- B. Operational Testing: Perform operational testing after hydrostatic testing is completed, backfill is in place, and sprinklers are adjusted to final position.

3.17 DEMONSTRATION

- A. Demonstrate to Architect that system meets coverage requirements and that automatic controls function properly.
- B. Demonstrate to Owner's maintenance personnel operation of equipment, sprinklers, specialties, and accessories. Review operating and maintenance information.
- C. Provide 7-days' written notice in advance of demonstration.

END OF SECTION 328401

SECTION 329300 – LANDSCAPE PLANTING

PART 1 – GENERAL

1.1 SUMMARY

- A. The extent of the landscaping development work is shown on the drawings and in schedules. This work includes:
 - 1. Obtaining and paying for permit fees, inspections and tests required for the installation of landscape planting.
 - 2. Providing and placement of all plant material, topsoil, mulch, sod, seed, miscellaneous materials and maintenance of landscape planting and associated guarantees.
 - 3. Repair the existing Landscape Planting as required to restore to “as-new” condition.
 - 4. Attendance at Pre-Construction Conference

1.2 RELATED WORK

- A. Division 1 – Section – SUMMARY
- B. Division 32 Section - Irrigation Systems
- C. Division 32 Section – Drip Irrigation

1.3 QUALITY ASSURANCE

- A. Plants shall conform to names indicated on the drawings and plant list and to the nomenclature listed in the American Joint Committee on Horticultural Nomenclature’s “Standardized Plant Names”, latest edition.
- B. Size, quality, handling, planting and maintenance of plant materials shall be in accordance with “American Standard for Nursery Stock”, ANSI Z60-1996, American Association of Nurserymen, Inc. Minimum acceptable sizes of plants, measured before pruning with branches in normal position, shall conform to measurements specified in the Plant Materials Key.
- C. Plants shall be subject to the Landscape Architect’s inspection and approval at place of growth or upon delivery for conformity to specification requirements. Such approval shall neither preclude right of rejection upon delivery at the site or during progress of work, nor right of rejection at the site due to damage suffered in handling or transportation. Inspection of plants by the Landscape Architect before digging shall be at the option and expense of the Owner.
 - 1. All plant material will be inspected again at time of final inspection and once again at the end of the warranty period.
 - 2. Any plant material found to be unacceptable at any inspection shall be immediately removed and replaced.
- D. Contractor will provide and pay for materials testing. Testing agency shall be acceptable to the Landscape Architect.
 - 1. Test representative samples of materials proposed for use. Materials used in the work shall be the same materials as tested. Do not use proposed material in the work until test

reports have been reviewed by the Landscape Architect and approval obtained to proceed with plant excavations.

E. Test reports: Provide the following information:

1. Topsoil:
 - a. Mechanical analysis.
 - b. Percentage of organic content.
 - c. Recommendations on the type and quantity of soil nutrient additives required to bring nutrients to a satisfactory level for specified plants.
 - d. Recommendations on the type and quantity of soil additives required to bring the pH of soil to a value of 5.5-7.0 (unless otherwise noted).
 - e. SAR
 - f. Soluble Salts
2. If on-site topsoil is used, provide a minimum of 4 separate tests to verify mechanical analysis, organic matter content, and nutrient level and pH value of topsoil. Sample locations as directed by the Landscape Architect.
3. Compost:
 - a. Carbon Nitrogen ratio
 - b. Moisture content
 - c. Mechanical Analysis
 - d. Recommendations on the type and quantity of soil additives required to bring the pH of soil to a value of 5.5-7.0 (unless otherwise noted).
 - e. SAR
 - f. Soluble Salts

F. Landscape work shall be done by a single firm specializing in landscape construction work with minimum 5 years' experience completing projects of similar size and complexity.

1. Contractor to provide list of past projects completed during last three (3) years at time of first bid proposal.

1.4 SUBMITTALS

- A. General: Submit each item in this article and for each item listed in Part 2 – Materials for review and approval according to the General Conditions of the Contract and Specifications - Division 1.
- B. Submit Certificate of Inspection of plant material by state or federal authorities.
- C. Submit commercial soils test with material test reports and soil nutrient additive recommendations.
- D. Submit a label from the manufacturer's container certifying fertilizer content.
- E. Submit samples of proposed mulch for use in planting beds.

- F. Submit complete written maintenance instruction at least 10 days prior to end of maintenance period. Include all requirements for proper care, development and maintenance of planting.
- G. Submit within 20 days of award of the bid to general contractor a planting schedule stating sources from which said Contractor can provide the plant materials in the quantity and size indicated on the Drawings.
 - 1. Substitutions for plant material that is not obtainable may be proposed in writing prior to bid. Submit written statement from plant materials supplier(s) with proposal for equivalent material for evaluation and acceptance prior to bid.
- H. Submit photographs and other descriptions of all plant material that is located outside of a 90 mile radius of project location. Provide specific growing location address.
- I. Submit contractor's Guarantee Form for Landscape Architect's review.
- J. Certification of grass seed of proposed sod: From seed vendor for each grass seed monostand or mixture stating the botanical and common name and percentage by weight of each species and variety, percentage of purity, germination and weed seed. Include the year of production and date of packaging. Identify name and telephone number of supplier.
- K. Submit data sheet on Landscape Fabric for review and approval.

1.5 VERIFICATION OF DIMENSIONS AND QUANTITIES

- A. All scaled dimensions are approximate. Before proceeding with any work, the Contractor shall carefully check and verify all dimensions and quantities, and shall immediately inform the Landscape Architect of any discrepancy between the information on the Drawings and actual conditions, refraining from doing any work on said areas until given approval to do so by the Landscape Architect.
- B. Plant quantities listed on the Drawings are for the convenience of the Contractor only and are not guaranteed. All planting indicated on the Drawings will be required unless indicated otherwise.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Prepare, transport and handle plants to ensure protection against injury. Cover all plants while transporting to the site.
- B. Deliver plants with legible waterproof identification labels.
- C. Temporary storage of new material:
 - 1. No new plants shall remain in temporary storage over the winter or summer. Plants that are not planted immediately shall be protected as follows:
 - a. Plants shall remain on the site of the work no longer than three days prior to being planted or placed in storage.
 - b. The earth balls shall be kept moist and their solidity carefully preserved. To prevent drying out or freezing, store plants in a compact group with suitable mulch material placed around and between the balls so they are completely covered. The method of storage of plants and mulch material shall be acceptable to the Landscape Architect.
 - c. Provide irrigation to stored plants.

- D. Do not deliver or use topsoil in frozen or muddy conditions.
- E. Packaged materials shall be delivered in factory labeled containers showing weight, content and manufacturer. Protect all materials from damage and deterioration during delivery and storage at site.

1.7 GRADING

- A. Examine the subgrade, verify the elevations of topsoil, planting mix or mulch. Observe the conditions under which work is to be performed, and notify the Landscape Architect of unsatisfactory conditions. Do not begin landscape work until unsatisfactory conditions have been improved.

1.8 EXCAVATION

- A. When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify the Landscape Architect before planting.

1.9 EXISTING UTILITIES

- A. Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate, as required, to minimize possibility of damage to underground utilities. The Contractor shall have the area "Blue Staked" prior to digging. It is the responsibility of the Contractor to repair or replace any damage caused by its workers at no expense to the Owner.

1.10 PLANTING SCHEDULE

- A. Before bidding each bidder shall investigate sources of supply and determine availability of all plants specified on the planting list in size, variety and quantity. Failure to take this precaution will not relieve the successful bidder from responsibility as a contractor to furnish and install all plant material in strict accordance with the contract without additional expense to the Owner.
- B. Prepare a proposed planting schedule for approval by the Landscape Architect. Schedule the dates for each type of landscape work during the normal seasons for such work in the area of the site. Correlate with specified maintenance periods to provide maintenance throughout the specified time period. Once accepted, revise dates only as approved in writing, after documentation of reasons for delays.
- C. Proceed with and complete the landscape work as rapidly as portions of the site become available, working within the seasonal limitations for each kind of landscape work required.
 - 1. Planting Restrictions: Coordinate planting periods with maintenance periods to provide required maintenance from date of planting until the date of Substantial Completion.
 - 2. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

1.11 ESTABLISHMENT, MAINTENANCE, REPLACEMENT, AND GUARANTEE

- A. The establishment period shall begin at the time that the planting phase of the work is completed, inspection and written notice is given and shall continue until substantial line. See Total Site Maintenance section 3.11.

- B. Maintenance shall include but not be limited to watering, weeding, pruning, spraying, adjusting of guys, and lawn maintenance as described herein.
- C. Remove and replace trees found to be unacceptable at the time of substantial completion and at any time during the guarantee period. Replacements shall be made during the guarantee period. Replacements shall be made during the growing season and shall comply with all requirements and specifications. Replacement shall also match specified trees in specie, size, and condition. Any delaying the completion of any item of work in the planting operation which extends the planting into more than one season shall extend the guarantee period accordingly.
- D. Any plants that settle below or rise above the desired finished grades during establishment or guarantee period shall be reset at the proper grades.
- E. Guarantee a close knit stand of grass by watering, mowing, regrading and resodding eroded areas and otherwise maintaining lawn area to the satisfaction of the Landscape Architect, until final acceptance. Any areas, which fail to show a thick, vigorous, healthy grass stand, shall be re-sodded at Contractor's expense with the same seed or sod originally specified. Resod as required until all affected areas are accepted by the Landscape Architect.
- F. The grow-in period or maintenance period for sod shall be a minimum of 60 days.
- G. Guarantee all planting for one year following signature of Owner on the final contract payment application.
- H. The Contractor will not be responsible for plants destroyed or lost due to occupancy of the project, or vandalism on the parts of others or if the failure of any plant material can be proven to the Landscape Architect to be beyond the control of the Contractor.
- I. At the end of the guarantee period a final inspection of all planting included in this contract will be made by the Landscape Architect. At that time any plant found not to be in a healthy growing condition, broken, damaged, or not exhibiting the desired characteristics of the plant shall be noted. These noted plants shall be removed as specified above.

PART 2 – MATERIALS

2.1 TOPSOIL

- A. Topsoil for planting operations shall be imported onto the project site. It shall be friable, fertile, natural loam containing a liberal amount of humus, or natural surface soil typical for this locality, and shall be capable of sustaining vigorous plant growth. It shall be free of admixture of subsoil and shall be reasonable free of stones, lumps, clods of hard earth, plants or their roots sticks, or other extraneous matter. It shall not be used for planting operations in a frozen or muddy condition.
- B. Topsoil shall conform to the following standards:
 - 1. Soluble Salts (dS/m or mmho/cm) <4
 - 2. PH 5.0-8.2
 - 3. % Sand <70
 - 4. % Silt <70
 - 5. % Clay <30
 - 6. Organic Matter ≥1.0
 - 7. % Course fragments <5.0
 - 8. SAR <7

- C. Prior to installation of topsoil to planter areas on the site, the Contractor shall furnish commercial soil tests of the existing material for Landscape Architect's approval. If such tests indicate the topsoil to be other than the type specified it shall be replaced with topsoil which shall conform to the specifications at no additional compensation to the Contractor.
- D. Topsoil shall not be used for planting operations while in a frozen or muddy condition.
- E. If topsoil import is required, the new topsoil shall meet conform to the mechanical analysis and standards of the existing on site topsoil on site. Prior to installation of new topsoil to planter areas on the site, the Contractor shall furnish commercial soil tests of the proposed material for Landscape Architect's approval. If such tests indicate the proposed topsoil does not match the topsoil analysis of the existing topsoil, it shall be replaced with a topsoil which shall conform to the existing specifications at no additional compensation to the Contractor

2.2 ORGANIC SOIL AMENDMENT

- A. Compost: Well composted, stable and weed free organic matter, pH range of 5.5 to 8" moisture content 35 to 55 by weight; 100 percent passing through a 1/4" sieve; soluble content of 5 to 10 decisiemens/m; not exceeding .5 percent inert contaminants and free of substances toxic to planting.
- B. Compost to meet USU extension Compost Quality Guidelines for Landscaping.
- C. Organic soil amendments (compost) shall be composted and nitrogen stabilized by one of the following manufacturers:
 - 1. Soil-pep by Mt. West Products, Rexburg, Idaho
 - 2. Replenish Products,
 - 3. Nutrimulch, Moroni, Utah

2.3 INORGANIC SOIL AMENDMENTS

- A. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum of 99 percent passing through No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through No. 40 (.425-mm) sieve.

2.4 PEAT MOSS

- A. Peat moss used in planting soil preparation: High quality pure Canadian sphagnum peat with a pH value not less than 3.5 nor greater than 6.0 at 25 degrees C. The ash content shall be not more than 10% and water holding capacity shall be not less than 800%. Peat moss shall have an organic content not less than 95%.

2.5 BACKFILL

- A. Backfill soil mixture shall be the following materials well mixed in the specified proportions, which are by volume.

<u>Product</u>	<u>Proportion</u>
Peat moss or organic soil conditioner	1 part
Topsoil	4 parts

2.6 COMMERCIAL FERTILIZER – LAWNS

- A. Fertilizer for lawns shall be commercial fertilizer, uniform in composition, dry and free flowing. It shall contain the following percentage by weight: 4% of nitrogen, 4% of phosphoric acid, 3% of potash. Fertilizer shall be delivered mixed as specified in standard-sized bags, showing weight, analysis of content, and name of manufacturer as required by state regulations. If soil tests recommend variance from these percentages obtain Landscape Architect's approval prior to applications.

2.7 COMMERCIAL FERTILIZER – TREES AND SHRUBS

- A. Fertilizer for trees, shrubs and ground cover planting areas shall be slow release type, Osmocote 18-6-12 used according to manufacturer's printed instructions.

2.8 TURFGRASS SOD

- A. Turfgrass Sod: Certified Number 1 Quality/Premium, including limitations on thatch, weeds, diseases, nematodes, and insects, complying with TPI's "Specifications for Turfgrass Sod Materials" in its "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.
- B. Sod shall be cultivated sod, free of weeds and undesirable grasses, machine cut to supplier's standard width and length and 5/8" thick. Measurement for thickness shall exclude top growth and thatch. Blend of grasses shall contain Kentucky Bluegrass and Perennial Ryegrass and shall be of good texture, free from noxious roots, stones and foreign materials. The sod shall be nursery grown, and shall be well rooted one (1) year old growth of permanent and desirable grasses, suitable for growth in the general location of the project.

1. Sod shall be composed of the following grass varieties in the proportions stated:

Grass Type and Variety	Percent by Weight	Purity	Germination
Kentucky Bluegrass "Goldrush"	16	98	85-90
Kentucky Bluegrass "Baron"	16	98	85-90
Kentucky Bluegrass "KenBlue"	16	98	85-90
Kentucky Bluegrass "Limosine"	16	98	85-90
Kentucky Bluegrass "Midnight"	16	98	85-90
Perennial Ryegrass "Brightstar II"	5	98	85-90
Perennial Ryegrass "Majesty"	5	98	85-90
Penn Lawn Creeping Red Fescue	5	98	85-90
Treasure Chewing Fescue	5	98	85-90

- C. The surface on which lawn is to be installed shall be firm and free of footprints, depressions or undulations of any kind. The surface shall be free of all rocks larger than 1/2" in diameter and all sticks, roots, rubbish, and other extraneous materials.
- D. If a crust has formed on the topsoil, it shall be loosened by raking prior to seeding.

2.9 PLANT MATERIAL

- A. All plants are subject to approval regarding size, health, quantity, character, etc. by the Landscape Architect.

- B. The Contractor shall furnish and plant all plants shown on the Drawings, as specified and in quantities as shown. Quantities if shown, are included for the convenience of the Contractor only and the Contractor shall be required to furnish all individual plants in quantities actually located on the Drawings. Each bidder shall investigate the sources of supply and satisfy himself that he can supply all of the plants mentioned in the planting lists in size, variety and quality noted and specified before submitting his bid. Failure to take this precaution will not relieve the successful bidder from his responsibility as Contractor for the furnishing and installing of all the plant material in strict accordance with the contract requirements without additional expense to the Owner.
- C. All plants shall have been grown in nurseries which have been inspected or do not require inspection by the State Department of Agriculture and have complied with all the regulations thereof, in accordance with good horticulture practice.
- D. Plant names used in the Plant Material Key conform to "Standardized Plant Names" by the American Joint Committee of Horticulture Nomenclature, except in cases not covered therein. In these instances, the custom of the nursery trade is followed.
- E. Plant materials shall conform to the Plant Material Key shown on plans and to the requirements of the "Horticultural Standards" of the American Association of Nurserymen as to kind, size, age, etc. and shall be typical first-class representatives of their species or variety, and shall have a normal habit of growth, unless specified otherwise. They shall be sound, healthy and vigorous with a well-developed root system.
- F. All plants shall have been grown under climatic condition similar to those in the locality of the project for at least two (2) years and shall have been transplanted or root pruned at least once in the last two (2) years.
- G. All plants shall be number one quantity specimens and shall have a uniform matching caliper, size and canopy, be symmetrical with standard height, spread and branching patterns. No park grade plant material is acceptable.
 - 1. Trees shall have straight single leaders with symmetrical primary branching and considerable well-spaced secondary branching filling out the head with no gaps.
- H. Plants shall be marked for identification. Each bundle of plants and at least 25% of each species and variety of separate plants in any one (1) shipment shall have legible labels securely attached before delivery to the site.
- I. All trees shall be measured when their branches are in their normal position. Height and spread dimensions specified refer to the main body of the plant and not from branch or root tip to tip. No trees which have had their leaders cut, or so damaged that cutting is necessary, will be accepted. Measure caliper of all trees 4" and larger 12" above the surface of the ground. Measure all trees less than 4" in caliper 6" above finish grade.
- J. All plants shall be symmetrical and shall conform to the size, age and condition as specified on the plant list shown on the Drawings. Exceptions are as follows:
 - 1. Plants larger than specified in the plant list may be used if approved by the Architect; but use of such plant shall not increase the contract price. If the use of larger plants is approved, the spread of roots and ball earth shall be increased in proportion to the size of the plant. Bare root plants furnished in size greater than specified shall be balled and burlapped when required by the Landscape Architect.

2. Where caliper or other dimensions of any plant materials are omitted from the Plant Material Key, it shall be understood that these plant materials shall be normal stock for type listed and at a minimum, the average size of all the material listed.
- K. Plants shall not be pruned prior to delivery except as authorized by the Landscape Architect. In no case shall trees be topped before delivery.
- L. No plants shall be dug or delivered to the site until the required inspections have been made and the plants or samples approved.
- M. Dig balled and burlapped (BB) plants with firm, natural balls of earth, of diameter not less than specified and of sufficient depth to include all fibrous and feeding roots. No plant moved with a ball will be accepted if the ball is cracked or broken before or during planting operations, except on special approval of the Architect.
- N. Roots or balls or all plants shall be adequately protected at all times from sun and/or drying winds.
 1. All balled and burlapped plants which cannot be planted immediately upon delivery shall be set on the ground and shall be well protected with soil, wet moss, or other acceptable material.
 2. Bare rooted plants, which cannot be planted immediately, shall be planted or heeled-in in trenches immediately upon delivery. No materials heeled-in more than one week may be used. Bundles of plants shall be opened and the plants separated before the roots are covered. Care shall be taken to prevent air pockets among the roots. During planting operations, bare roots shall be covered with canvas, wet straw or other suitable materials.
 3. No plant shall be bound with wire or rope at any time so as to damage the bark or break branches.
- O. Plants marked "cans", "pots" or "other container" on the plant list shall have been grown in the containers for a minimum of six (6) months and a maximum of two (2) years. Roots shall fill the containers but show no evidence of being or having been root bound. Plants shall not be picked up or moved by stem or branches, but shall be lifted and handled from the sides of the containers.
- P. Trees shall have straight trunks and all old abrasions and cuts shall be completely callused over.

2.10 GUYING AND STAKING MATERIAL

- A. Tree stakes: steel "T" post, 8' long.
- B. Hose: High quality 2-ply fabric bearing braided rubber, 5/8" diameter and suitable length (Color Black).
- C. Wire: 12 gauge galvanized steel.
- D. Guying cable: galvanized steel, #9 gauge, Timbles and clips shall be used for connections and splices.
- E. Turnbuckles: Galvanized or zinc dip painted with an 8" lengthwise opening fitted with eye bolts and spot welded or fitted with a locking device to prevent vandalism.
- F. Guying stakes: 2" x 2" x 33", notched hardwood.

2.11 GRAVEL MULCH

- A. Mulch shall be consist of a 3/4" to 1" clean washed aggregate. Color to be selected by the Owner and Landscape Architect. Color selection shall be made from a minimum of 3 colors.

2.12 WEED BARRIER FABRIC

- A. Fabric shall be UV resistant, woven spunbond needle punch, polypropylene, wt. 5 oz. per square yard, bonded to a non-woven polypropylene fabric color black.

2.13 ANTI-TRANSPIRANT

- A. Anti-TRANSPIRANT solution for horticultural spray application. Use Bio-Plex, by Bioplex Organics, Inc. (800-441-3573).

2.14 WATER

- A. Potable water

2.15 TREE WRAP

- A. Tree wrap shall be Kraft paper tree wrap, 3" wide or TREESAVER brand perforated tree wrap as manufactured by Mountain Valley Seed, Inc. 1800 South West Temple, Salt Lake City, Utah, 84115, telephone (801) 486-0480. Wrap shall be resistant to weather degradation and require no maintenance and must stretch as the girth of the truck increases over time.

PART 3 – EXECUTION

3.1 COORDINATION

- A. The contractor shall coordinate his work with other contractors on site, and shall cooperate to the fullest extent to see that the work is completed in a timely and workmanship like manner.

3.2 INSTALLATION OF TOPSOIL

- A. Prior to the installation of any topsoil, Contractor shall inspect the existing subgrade for compliance to the specifications regarding elevation, slope, grade and cleanliness. Any deficiency shall be reported to the Landscape Architect. Work begun in any area will acknowledge acceptance of area for Landscape planting.
- B. When contract operations have been completed to a point where planting areas will not be disturbed, subgrade shall be cleaned free of waste material of all kinds. In all planted areas dig out all to weeds by their roots and remove from site. Scarify and pulverize the subgrade to a depth of not less than 6" inches. Scarification shall be completed in all areas that are to be planted, or sodded.
- C. Spread the topsoil to a minimum depth of 12" in planting beds and ground cover areas allowing for the installation of the weed barrier fabric and 3" of gravel mulch. Till to a depth of 6".

- D. Spread the topsoil and till to a minimum depth of 6" in all lawn areas. Do not place topsoil over subgrade that is frozen or damp. Place topsoil just prior to seeding so as to discourage weed growth.
- E. Topsoil shall be rolled by a hand roller on small areas. After rolling at a weight of 150-200 pounds per linear foot of roller, the grade shall again be graded to the specified grade with a smooth surface. Large areas shall be graded by passing a land plane in three different directions over the entire area to be planted.
- F. Surface drainage shall be insured, and if shown, shall be directed in the manner indicated on the Drawings by molding the surface to facilitate the run-off water. Fill low spots and pockets with topsoil and grade to drain properly.
- G. The finish grade of the topsoil adjacent to all sidewalks, mow strips, etc., and prior to planting shall be 1½" below the top surface of adjacent pavement or hard surface of any kind.
- H. The Landscape Architect shall approve the finish grading prior to application of seed, sod or plant material. Make minor adjustments to finish grades at the direction of the Landscape Architect.

3.3 PREPARATION FOR PLANTING TREES AND SHRUBS

- A. All sprinkler system work and finish grading shall be approved by the Landscape Architect prior to any planting. No planting will be done without direct supervision of the Landscape Architect. Tree planting shall precede lawn planting.
- B. Locate the exact placement of all trees and secure approval of the Landscape Architect prior to the digging of any holes. Refer to the Drawings for the sizes and preparation of holes. Prepare all holes according to the details on the Drawings.

3.4 PREPARATION OF LAWN AREAS

- A. The surface on which lawn is to be installed shall be firm and free of footprints, depressions or undulations of any kind. The surface shall be free of all rocks larger than 1/2" in diameter and all sticks, roots, rubbish, and other extraneous materials.
- B. If a crust has formed on the topsoil, it shall be loosened by raking prior to seeding.
- C. Apply fertilizer directly to subgrade before loosening.
- D. Spread topsoil and fertilizer on surface, and thoroughly blend.
- E. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
- F. Unchanged Subgrades: If lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, prepare surface soil as follows:
- G. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
- H. Loosen surface soil to a depth of at least of **6 inches (150 mm)**. Apply fertilizers according to topsoil report. Till soil to a homogeneous mixture of fine texture.
- I. Remove stones larger than **1/2 inch (12 mm)** in any dimension and sticks, roots, trash, and other extraneous matter.

- J. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.
- K. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch (13 mm) of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future.
- L. The surface shall be smooth and loose and of uniformly fine texture immediately before seeding. Prepare only enough ground that can be seeded within 24 hours thereafter.
- M. No seeding shall be done after a rain, or if the surface has been compacted, without first loosening the surface of the ground.
- N. On all areas, use a fertilizer combination of 16-16-8 commercial fertilizer applied at the rate of fifteen (15) pounds per 1000 sq. ft. and work into the top 2" of soil at least two (2) days before sowing grass seeds. No fertilizer other than those types and quantities called for in these specifications shall be used on these planting without consent of the Landscape Architect. It shall be the responsibility of this Contractor to notify the Landscape Architect and Owner in writing three (3) days prior to fertilizing to provide visual verification of work.

3.5 TREE AND SHRUB PLANTING

- A. Prior to planting, fill excavated planting hole with water and allow to percolate out. If, after 24 hours, the water has not percolated out of the pit, notify the Landscape Architect. Do not plant until the problem has been corrected.
- B. The planting holes from the bottom to the top of the opening should be the same depth as the root ball. Plants must be placed plumb and straight in the planting hole. The tree hole depth shall be determined so that the tree may be set at finish grade, using the top of the root ball as a guide.
- C. All trees and shrubs shall be planted in pits as detailed in the planting details contained herein or as noted on the drawings. Tree and shrub pits in lawn areas shall be circular in outline, with a diameter at least two (2) feet greater than the diameter of the ball of each plant to be planted.
- D. Plants in cans shall be planted in pits having a diameter at least two (2) feet greater than the diameter of the can from which the plant is taken. Bare root trees and shrubs shall be planted in pits having a diameter at least two (2) feet greater than the root system. All plant pits shall be at least one (1) foot deeper than the root system or root ball.
- E. All subsoil excavated from tree and shrub pits shall be removed from the site, and the ground for one (1) foot below the bottom of the hole for trees and large evergreens will be broken up with a pick or other similar tool to facilitate penetration of the new roots.
- F. The plant shall be set vertically upon a 12" inch mound of backfill soil mixture, backfilled carefully and firmly worked and tamped under and around the root system or ball to fill all voids. When partially backfilled and compacted the burlap shall be removed from the sides of the balls and the tops cut or adjusted to prevent the formation of air pockets, no burlap shall be pulled from under the root balls of the plants. The plants shall then be watered with a hose to completely soak the roots and backfilled with soil mixture.
- G. All tree holes shall be backfilled with specified backfill in 12" inch lifts and settled and tamped to minimize any settling of the tree.

- H. When the root ball is partially backfilled and compacted all burlap, ropes, or wire baskets shall be removed from the sides of the root ball. No burlap shall be pulled from under the root balls of the plants. The plants shall then be watered with a hose to completely soak the roots and the backfilled soil mixture.
- I. Fertilize with tree and shrub fertilizer according to manufacturer's printed instructions.
- J. Containers shall be removed from the root balls by cutting with cutters. Do not damage root ball by using trunk or main stem as a handle.
- K. All plants shall be thoroughly watered immediately following planting. This shall mean full and thorough saturation of all backfill in the pits and beds during the same day of planting. Water shall only be applied by an open end hose at very low pressure to avoid air pockets, injury or washing. When planted, watered, and fully settled, trees shall be vertical.
- L. The Contractor shall hand water newly planted trees twice a week for eight weeks. A minimum of five (5) gallons of water per tree is required.
- M. The amount of pruning shall be limited to the minimum necessary to remove dead or injured twigs and branches. All cuts, scars and bruises shall be properly treated according to the direction of the Landscape Architect. Proper pruning techniques shall be used. Do NOT leave stubs and do NOT cut the leader branch. Improper pruning shall be cause for rejection of the plant material.
- N. A 3" deep saucer shall be formed at the edge of plant pit. Water the same day as planted.
- O. Saucer shall not be required when planted where edging is required around plant pits. When trees are planted in lawn areas cut a neat opening in sod that is 36" diameter.
- P. Within 48 hours of planting each plant remove all undesirable material from the surface of the planting beds, including all rocks over the size of 1 ½" diameter. Install the specified mulch to a uniform depth of 3" in the entire planting beds and all tree basins.
- Q. This Contractor shall dispose of, off the site, all soil excavated from tree and shrub pits.

3.6 PLANTING GROUND COVERS

- A. Space plants as shown or scheduled.
- B. Dig holes large enough to allow for spreading of roots and backfill with planting soil. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water. Water thoroughly after planting, taking care not to cover crowns of plants with wet soils.
- C. Fertilize entire bed with slow release shrub fertilizer at rate recommended in manufacturer's printed instructions.

3.7 TREE STAKING AND GUYING

- A. All trees including evergreen trees shall be either staked or guyed.
- B. Trees in containers shall be staked as follows:
 - 1. Two (2), two (2) inch by two (2) inch stakes eight (8) feet in length will be used to support each tree planted under this contract unless otherwise indicated. Tree ties shall be made of five-eighths (5/8) inch rubber hose with a number ten (10) gauge wire inserted through

the hose and nailed to the stakes by eight-penny nails, see the detailed sheet accompanying these specifications. Each stake will be located six (6) to eight (8) inches away from the trunk and each opposing the other to provide maximum support to the trunk. The stakes will be driven into the hole after the tree has been set-in, but before backfilling begins so as to avoid damage to the roots.

C. Balled and burlapped trees and all evergreen trees shall be guyed as follows:

1. All trees shall be guyed at points of branching with three (3) guy wires spaced equally around and outside the perimeter of the ball. Guy wires shall be covered with rubber hose or the bark otherwise protected by approved materials at points of contact. Each guy shall be positioned below crotches and fastened to a 2"x4"x 20" deadman, 12" below grade. One 6" turnbuckle shall be provided for each guy.

3.8 TREE WRAPPING

- A. All trees shall be wrapped with tree wrap. Wrap shall be applied to trunks immediately after planting to protect bark against winter injury caused by diurnal temperature fluctuations. Wrap shall be resistant to weather degradation and require no maintenance and must stretch as the girth of the trunk increases over time.
1. Starting as low as possible, wrap tree wrap in a smooth spiral to assure overlapping each previous wrap by about $\frac{1}{4}$ ".
 2. Continue wrapping up the trunk to just below the second scaffold branches. Wrapping the crotches is optional.
 3. Tie off tree wrap with a half hitch knot.
 4. Cover the base of the tree and the first wrap of tree wrap with soil.

3.9 SODDING

- A. Place sod in locations shown only after fine grading has been completed. The top soil and sub-base shall be moist enough to resist shifting and have one (1) application of commercial fertilizer 16-16-8 at the rate of 3 lbs. per 1,000 sq. ft. just prior to the laying of the sod.
- B. Sod may be placed at any time when the ground is not frozen. Sod shall be cut and laid on site within a 48 hour period following harvest. The surface on which the sod is to be laid should be firm and free from footprints or other depressions. A string or line of boards may be used as a guide for setting the first line of sod across the area. Sod of the next course are matched against the edge of this first line in such a way the joints between the individual sod pieces in the two lines do not coincide. Successive courses are matched against the last line laid, in the same manner.
- C. The joints shall be closely laid and filled with a mixture of grass seed and screened topsoil at the rate of two (2) pounds of seed to each cubic yard of topsoil. It shall be thoroughly tamped to a true and even surface at the required finished grade.
- D. Slopes greater than 1:3 should be staked down by driving a wooden peg through the sod. Always lay sod across slope. Wire stakes shall not be used for pegging sod.
- E. Roll firmly but lightly, tamp with suitable wooden or metal tamper, all new sod sufficiently to set or press sod into underlying soil.

- F. Upon completion of sodding and filling voids with soil, the sod is to be completely saturated with water. Watering of the sod shall be the complete responsibility of the Contractor by whatever means necessary to establish a vigorous growing lawn.
- G. The grass shall be mowed before it exceeds two (2") in height. The grass will be cut to not less than 1¼" and during the establishment and maintenance period the lawn shall not exceed two (2") in height. Lawn clippings that remain on the lawn surface longer than 4 days shall be removed and disposed of properly.
- H. Protection of the newly laid sod shall be the complete responsibility of the Contractor. Provide acceptable visual barriers by means of barricades set at appropriate distances and strings or tapes between the barriers as an indication of new work. Restore any damaged areas caused by others, erosion or vehicular traffic until such a time as the lawn is accepted by the Owner.

3.10 CLEAN UP AND PROTECTION

- A. During landscape work store materials and equipment where directed. Keep pavement clean and work area in an orderly condition.
- B. Protect landscape areas, work and materials from damage due to operations by other contractors and trades, trespassers. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged landscape work as directed.
- C. Keep the site free from accumulation of waste material. At the time of completion, all areas must be swept and washed clean and all rubbish removed to the satisfaction of the Landscape Architect.
- D. Temporary occupancy of the project shall not relieve the contractor of any of the obligations enumerated in the Contract Documents.

3.11 TOTAL SITE MAINTENANCE

- A. As part of this Contract, this Contractor shall be responsible for the continuous maintenance of all landscape areas, i.e., weeding, watering, mowing, fertilization, etc. from the time that each section of lawn is required to be planted (see Drawings) until the Project Date of Substantial Completion. **All Landscape planting in this section shall be maintained until Sept 1, 2015.** If any lawn area is deemed not to be substantially complete by the Project Date of Substantial Completion or the above date, whichever is later, all required maintenance shall be provided by this Contractor after the Project Substantial Completion date, until said area is substantially complete. If landscape or turf areas are not deemed substantially complete by the Owner and Architect by the date of substantial completion, the Owner may at his discretion, require the following remedies at no additional cost, in addition to the standard maintenance required for sodded or seeded areas:
 - 1. Sodding of seeded areas.
 - 2. Additional fertilization operations
 - 3. Additional mowing operations
 - 4. Additional specific watering operations
 - 5. Weed control measures
 - 6. Aerating operations

- B. Maintain plants in a vigorous, thriving condition by watering, cultivating, weeding, pruning, spraying and other necessary operations. No trees or shrubs will be accepted unless they are healthy and show satisfactory foliage conditions. Plants shall be maintained through the length of the total site maintenance period.
 - 1. All planted areas shall be cultivated at least every two (2) weeks and raked smooth, to present a neat appearance.
 - 2. Spray as required to keep plant materials free of disease and insects.
 - 3. Replace mulch to maintain specified depth.
 - 4. All new tree and shrub plantings shall be hand watered thoroughly at least twice a week during the maintenance period.
- C. The Contractor shall instruct the Owner as to the watering requirements and shall monitor such operations at all times. The Contractor shall be held responsible for failure to monitor the watering requirements and shall be held responsible to replace any or all plants that are lost due to improper application of water.
- D. Lawns shall be maintained for as much time as necessary to establish over the entire lawn a close stand of grass of the varieties specified, free of weeds and undesirable coarse, native grasses.
- E. All lawns shall be fertilized every three (3) weeks with six (2) pounds of 16-16-8 commercial fertilizer per 1000 sq. ft. until the end of the maintenance period required. It shall be the responsibility of this Contractor to notify the Landscape Architect and Owner in writing 48 hours prior to fertilizing to provide visual verification of work.
- F. Maintenance shall include, in addition to the above, cleaning, edging and repair to erosion and all other necessary work of maintenance. Sidewalks and other paved areas shall be kept clean when planting and maintenance are in progress.
- G. Any and all sprinkler lines broken or disrupted during the construction and maintenance period shall be replaced to proper working order and be acceptable to the Owner.

3.12 FINAL INSPECTION AND ACCEPTANCE

- A. Inspection will be made of the entire site periodically and at the conclusion of the maintenance period required.
- B. The landscape work may be inspected for acceptance in parts agreeable to the Landscape Architect, provided the work offered for inspection is complete, including maintenance and that the area comprises one unit or area of substantial size.
- C. Written notice requesting final inspection shall be submitted to the Landscape Architect at least ten (10) days prior to the anticipated inspection date.
- D. Where inspected landscape work does not comply with the requirement, replace rejected work and continue specified maintenance until re-inspected by the Landscape Architect and found to be acceptable. Remove rejected plants and materials promptly from the project site.
- E. Final Acceptance: The work under this contract will be accepted upon written approval by the Landscape Architect and the Owner, on the satisfactory completion of all work, including maintenance.

- F. All work done under this contract shall be left in good order to the satisfaction of the Owner and the Landscape Architect and the Contractor shall without additional expense, replace any trees, etc. which develop defects or die within one year of the substantial completion.
 - 1. A written guarantee that covers the above provisions shall be signed by the Contractor and delivered to the Landscape Architect upon acceptance of the work.
 - 2. The guarantee shall not be binding upon the Contractor if any failure should be proved to the satisfaction of the Landscape Architect to result from circumstances or negligence of parties over whom the Contractor has no control.

3.13 RECORD DRAWINGS

- A. Record Drawings shall be furnished to the Landscape Architect at the time of the substantial completion inspection before a letter documenting Substantial Completion for the landscape planting will be issued. This information shall be provided in AutoCadd format and shall be given to the Landscape Architect before the project is accepted. The AutoCadd file shall be a copy of the original plans for the project and shall be corrected by the contractor at the Contractor's expense.

END OF SECTION 329300

SECTION 330500 - COMMON WORK RESULTS FOR UTILITIES

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. Piping joining materials.
 - 2. Transition fittings.
 - 3. Sleeves.
 - 4. Identification devices.
 - 5. Grout.
 - 6. Flowable fill.
 - 7. Piped utility demolition.
 - 8. Piping system common requirements.
 - 9. Equipment installation common requirements.
 - 10. Painting.
 - 11. Concrete bases.
 - 12. Metal supports and anchorages.

1.3 DEFINITIONS

- A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.
- B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- C. PVC: Polyvinyl chloride plastic.
- D. DI: Ductile Iron pipe

1.4 SUBMITTALS

- A. Product Data: For the following:

1. Identification devices.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

B. Coordinate installation of identifying devices after completing covering and painting if devices are applied to surfaces.

C. Coordinate size and location of concrete bases. Formwork, reinforcement, and concrete requirements are specified in Division 03.

PART 2 - PRODUCTS

2.1 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness, unless otherwise indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.

b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- D. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- E. Solvent Cements for Joining Plastic Piping:
 - 1. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
- F. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.2 TRANSITION FITTINGS

- A. Transition Fittings, General: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
- B. Transition Couplings NPS 1-1/2 and Smaller:
 - 1. Underground Piping: Manufactured piping coupling or specified piping system fitting.
 - 2. Aboveground Piping: Specified piping system fitting.
- C. AWWA Transition Couplings NPS 2 and Larger:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cascade Waterworks Mfg. Co.
 - b. Dresser, Inc.; DMD Div.
 - c. Ford Meter Box Company, Inc. (The); Pipe Products Div.
 - d. JCM Industries.
 - e. Smith-Blair, Inc.
 - f. Viking Johnson.
 - 3. Description: AWWA C219, metal sleeve-type coupling for underground pressure piping.
- D. Plastic-to-Metal Transition Fittings:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Spears Manufacturing Co.

3. Description: PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions.

E. Plastic-to-Metal Transition Unions:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Colonial Engineering, Inc.
 - b. NIBCO INC.
 - c. Spears Manufacturing Co.

F. Flexible Transition Couplings for Underground Nonpressure Drainage Piping:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cascade Waterworks Mfg. Co.
 - b. Fernco, Inc.
 - c. Mission Rubber Company.
 - d. Plastic Oddities.

- G. Description: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

2.3 SLEEVES

- A. Mechanical sleeve seals for pipe penetrations are specified in Division 22 Section "Common Work Results for Plumbing."
- B. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- C. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized, plain ends.
- D. Cast-Iron Sleeves: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- E. Molded PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.
- F. PVC Pipe Sleeves: ASTM D 1785, Schedule 40.

- G. Molded PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.4 IDENTIFICATION DEVICES

- A. General: Products specified are for applications referenced in other Division 33 Sections. If more than single type is specified for listed applications, selection is Installer's option.
- B. Equipment Nameplates: Metal permanently fastened to equipment with data engraved or stamped.
 - 1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and essential data.
 - 2. Location: Accessible and visible.

2.5 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

2.6 FLOWABLE FILL

- A. Description: Low-strength-concrete, flowable-slurry mix.
 - 1. Cement: ASTM C 150, Type I, portland.
 - 2. Density: 115- to 145-lb/cu. ft.
 - 3. Aggregates: ASTM C 33, natural sand, fine and crushed gravel or stone, coarse.
 - 4. Aggregates: ASTM C 33, natural sand, fine.
 - 5. Admixture: ASTM C 618, fly-ash mineral.
 - 6. Water: Comply with ASTM C 94/C 94M.
 - 7. Strength: 100 to 200 psig at 28 days.

PART 3 - EXECUTION

3.1 PIPED UTILITY DEMOLITION

- A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove piped utility systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 2. Piping to Be Abandoned in Place: Drain piping. Fill abandoned piping with flowable fill, and cap or plug piping with same or compatible piping material.
 3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make operational.
 5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING INSTALLATION

- A. Install piping according to the following requirements and Division 33 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on the Coordination Drawings.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping to permit valve servicing.
- E. Install piping at indicated slopes.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.
- H. Select system components with pressure rating equal to or greater than system operating pressure.
- I. Sleeves are not required for core-drilled holes.
- J. Permanent sleeves are not required for holes formed by removable PE sleeves.
- K. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
 1. Cut sleeves to length for mounting flush with both surfaces.
 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

- a. PVC or Steel Pipe Sleeves: For pipes smaller than NPS 6.

- L. Verify final equipment locations for roughing-in.
- M. Refer to equipment specifications in other Sections for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 33 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- E. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- G. Grooved Joints: Assemble joints with grooved-end pipe coupling with coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- H. Soldered Joints: Apply ASTM B 813 water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy (0.20 percent maximum lead content) complying with ASTM B 32.
- I. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- J. Pressure-Sealed Joints: Assemble joints for plain-end copper tube and mechanical pressure seal fitting with proprietary crimping tool to according to fitting manufacturer's written instructions.
- K. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.

2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.
 3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 5. PVC Nonpressure Piping: Join according to ASTM D 2855.
 6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.
- L. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- M. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.
- N. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
1. Plain-End PE Pipe and Fittings: Use butt fusion.
 2. Plain-End PE Pipe and Socket Fittings: Use socket fusion.
- O. Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.4 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 3. Install dielectric fittings at connections of dissimilar metal pipes.

3.5 EQUIPMENT INSTALLATION

- A. Install equipment level and plumb, unless otherwise indicated.
- B. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.
- C. Install equipment to allow right of way to piping systems installed at required slope.

3.6 PAINTING

- A. Painting of piped utility systems, equipment, and components is specified in Division 09 painting Sections.

- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 IDENTIFICATION

- A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
 - 1. Plastic markers, with application systems. Install on insulation segment if required for hot noninsulated piping. Place direct bury marker 12-18 inches above top of pipe but not less than 12-inches below finish grade.

3.8 GROUTING

- A. Mix and install grout for equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION 330500

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SECTION 334100 - STORM UTILITY DRAINAGE PIPING

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 gravity-flow, nonpressure storm drainage outside the building, with the following components:
 - 1. Special fittings for expansion and deflection.
 - 2. Cleanouts.
 - 3. Drains.
 - 4. Cast in place inlet boxes and catch basins.

1.3 DEFINITIONS

- A. PVC: Polyvinyl chloride plastic.
- B. CP: Non-reinforced concrete pipe.
- C. RCP: Reinforced concrete pipe.

1.4 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure, Drainage-Piping Pressure Rating: 10-foot head of water. Pipe joints shall be at least silttight, unless otherwise indicated.

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Special pipe fittings.
 - 2. Drains.
 - 3. Storage.
 - 4. Pipes.
- B. Shop Drawings: For the following:

1. Design calculations, and concrete design-mix report for cast-in-place manholes.]
 2. Catch Basins and Stormwater Inlets. Include plans, elevations, sections, details, and frames, covers, and grates.
 3. Stormwater Detention Structures: Include plans, elevations, sections, details, frames and covers, design calculations, and concrete design-mix report.
- C. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.
- D. Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 50 feet and vertical scale of not less than 1 inch equals 5 feet. Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.
- E. Field quality-control test reports.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic manholes, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle manholes according to manufacturer's written rigging instructions.
- D. Handle catch basins and stormwater inlets according to manufacturer's written rigging instructions.

1.7 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 Architect, Construction Manager, and Owner no fewer than two days in advance of proposed interruption of service. Coordinate interruptions during weekly meetings and at pre-construction meeting.
 2. Do not proceed with interruption of service without Architect's, Construction Manager's, and Owner's written permission.

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, manufacturers offering products that may be incorporated into the Work include local pre-cast manufacturers but are subject to approval of the engineer and architect.

2.2 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, fitting, and joining materials.

2.3 PVC PIPE AND FITTINGS

- A. PVC Pressure Pipe: AWWA C900, Class 150 for gasketed joints and using ASTM F 477, elastomeric seals.
 1. Fittings NPS 4 to NPS 8: PVC pressure fittings complying with AWWA C907, for gasketed joints and using ASTM F 477, elastomeric seals.
 2. Fittings NPS 10 and Larger: Ductile-iron, compact fittings complying with AWWA C153, for push-on joints and using AWWA C111, rubber gaskets.
- B. PVC Water-Service Pipe and Fittings: ASTM D 1785, Schedule 80 pipe, with plain ends for solvent-cemented joints with ASTM D 2467, Schedule 80, socket-type fittings.
- C. PVC Cellular-Core Pipe and Fittings: ASTM F 891, Sewer and Drain Series, PS 50 minimum stiffness pipe with ASTM D 3034, SDR 35, socket-type fittings for solvent-cemented joints.
- D. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.
- E. PVC Sewer Pipe and Fittings, NPS 18 and Larger: ASTM F 679, T 2 wall thickness, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.
- F. PVC Profile Gravity Sewer Pipe and Fittings: ASTM F 794 pipe, with bell-and-spigot ends; ASTM D 3034 fittings, with bell ends; and ASTM F 477, elastomeric seals.

2.4 CONCRETE PIPE AND FITTINGS

- A. Nonreinforced-Concrete Sewer Pipe and Fittings: ASTM C 14, Class I, II or III, with bell-and-spigot ends and gasketed joints with ASTM C 443, rubber gaskets.
- B. Piping in paragraph below is available in 5 classes and 3 wall thicknesses, and in NPS 12 to NPS 144. Not all classes and wall thicknesses are available. Joints are gasket type. Contractor, at his option, may use non-reinforced pipe for sizes up to 21-inches if structural requirements based on load on pipe are not exceeded for that pipe. If reinforced pipe is selected, choose the pipe class and wall thickness to suit availability and structural requirements based on loads and cover.

- C. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76, with bell-and-spigot ends and gasketed joints with ASTM C 443, rubber gaskets.
 - 1. Class I
 - 2. Class II
 - 3. Class III

2.5 NONPRESSURE-TYPE PIPE COUPLINGS

- A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.
- B. Sleeve Materials:
 - 1. For Concrete Pipes: ASTM C 443, rubber.
 - 2. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 - 3. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - 4. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- C. Unshielded Flexible Couplings: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - 1. Manufacturers:
 - a. Dallas Specialty & Mfg. Co.
 - b. Fernco Inc.
 - c. Logan Clay Products Company (The).
 - d. Mission Rubber Company; a division of MCP Industries, Inc.
 - e. NDS Inc.
 - f. Plastic Oddities, Inc.
- D. Shielded Flexible Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - 1. Manufacturers:
 - a. Cascade Waterworks Mfg.
 - b. Dallas Specialty & Mfg. Co.
 - c. Mission Rubber Company; a division of MCP Industries, Inc.
- E. Ring-Type Flexible Couplings: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.
 - 1. Manufacturers:
 - a. Fernco Inc.

- b. Logan Clay Products Company (The).
- c. Mission Rubber Company; a division of MCP Industries, Inc.

2.6 PRESSURE-TYPE PIPE COUPLINGS

- A. Reducing or transition, metal, bolted, sleeve-type, reducing or transition coupling, for joining underground pressure piping. Include 150-psig minimum pressure rating and ends of same sizes as piping to be joined.
- B. Tubular-Sleeve Couplings: AWWA C219, with center sleeve, gaskets, end rings, and bolt fasteners.
 - 1. Manufacturers:
 - a. Cascade Waterworks Mfg.
 - b. Dresser, Inc.; DMD Div.
 - c. Ford Meter Box Company, Inc. (The); Pipe Products Div.
 - d. JCM Industries.
 - e. Romac Industries, Inc.
 - f. Smith-Blair, Inc.
 - g. Viking Johnson.
 - 2. Center-Sleeve Material: Manufacturer's standard.
 - 3. Gasket Material: Natural or synthetic rubber.
 - 4. Metal Component Finish: Corrosion-resistant coating or material.
- C. Split-Sleeve Couplings: With split sleeve with sealing pad and closure plates, O-ring gaskets, and bolt fasteners.
 - 1. Manufacturers:
 - a. Brico Industries.
 - 2. Sleeve Material: Manufacturer's standard.
 - 3. Sleeve Dimensions: Of thickness and width required to provide pressure rating.
 - 4. Gasket Material: O-rings made of EPDM rubber, unless otherwise indicated.
 - 5. Metal Component Finish: Corrosion-resistant coating or material.

2.7 SPECIAL PIPE FITTINGS

- A. Ductile-Iron Flexible Expansion Joints: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include 2 gasketed ball-joint sections and 1 or more gasketed sleeve sections, rated for 250-psig minimum working pressure and for offset and expansion indicated.
 - 1. Manufacturers:
 - a. EBAA Iron Sales, Inc.

- b. Romac Industries, Inc.
 - c. Star Pipe Products.
- B. Ductile-Iron Deflection Fittings: Compound coupling fitting with ball joint, flexing section, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for up to 15 degrees of deflection.
 - 1. Manufacturers:
 - a. EBAA Iron Sales, Inc.
- C. Ductile-Iron Expansion Joints: Three-piece assembly of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for expansion indicated.
 - 1. Manufacturers:
 - a. Dresser, Inc.; DMD Div.
 - b. EBAA Iron Sales, Inc.
 - c. JCM Industries.
 - d. Smith-Blair, Inc.

2.8 CLEANOUTS

- A. Gray-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
 - 1. Manufacturers:
 - a. Josam Company.
 - b. MIFAB Manufacturing, Inc.
 - c. Smith, Jay R. Mfg. Co.
 - d. Wade Div.; Tyler Pipe.
 - e. Watts Industries, Inc.
 - f. Watts Industries, Inc.; Enpoco, Inc. Div.
 - g. Zurn Industries, Inc.; Zurn Specification Drainage Operation.
 - 2. Top-Loading Classification(s): Light, Medium, Heavy, and Extra-heavy duty depending on location and expected driving load on cleanout.
 - 3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.
- B. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping. Place in grey iron housing with clamping device and round, secured, scoriated, gray-iron cover.
 - 1. Manufacturers:

- a. Canplas Inc.
- b. IPS Corporation.
- c. NDS Inc.
- d. Plastic Oddities, Inc.
- e. Sioux Chief Manufacturing Company, Inc.
- f. Zurn Industries, Inc.; Zurn Light Commercial Specialty Plumbing Products.

2.9 DRAINS

- A. Gray-Iron Area Drains: ASME A112.21.1M, round body with anchor flange and round secured grate. Include bottom outlet with inside calk or spigot connection, of sizes indicated.

1. Manufacturers:

- a. Josam Company.
- b. MIFAB Manufacturing, Inc.
- c. Smith, Jay R. Mfg. Co.
- d. Wade Div.; Tyler Pipe.
- e. Watts Industries, Inc.
- f. Watts Industries, Inc.; Enpoco, Inc. Div.
- g. Zurn Industries, Inc.; Zurn Specification Drainage Operation.

2. Top-Loading Classification(s): Medium and heavy duty depending on location and expected driving load.

- B. Gray-Iron Trench Drains: ASME A112.21.1M, 6-inch to 12-inch-wide top surface, rectangular body with anchor flange or other anchoring device, and rectangular secured grate. Include units of total length indicated and number of bottom outlets with inside calk or spigot connections, of sizes indicated.

1. Manufacturers:

- a. Josam Company.
- b. Smith, Jay R. Mfg. Co.
- c. Wade Div.; Tyler Pipe.
- d. Watts Industries, Inc.
- e. Watts Industries, Inc.; Enpoco, Inc. Div.
- f. Zurn Industries, Inc.; Zurn Specification Drainage Operation.
- g. Poly Drain, ABT

2. Top-Loading Classification(s): Medium, heavy, and extra-heavy duty.

2.10 MANHOLES (Not Used)

2.11 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318/318R, ACI 350R, and the following:

1. Cement: ASTM C 150, Type II.
 2. Fine Aggregate: ASTM C 33, sand.
 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 4. Water: Potable.
- B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water-cementitious materials ratio.
1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.
- C. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water-cementitious materials ratio.
1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.
- 2.12 POLYMER-CONCRETE, CHANNEL DRAINAGE SYSTEMS (Not Used)
- 2.13 CATCH BASINS
- A. Standard Precast Concrete Catch Basins: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
1. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
 2. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
 3. Top Section: Flat-slab-top type with hole for frame and grate is indicated.
 4. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
 5. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
 6. Grade Rings: Include 2 or 3 reinforced-concrete rings, of 6- to 9-inch total thickness, that match frame and grate.
 7. Steps: Not Used.
 8. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section. Size sections and box or manhole to fit pipes without necessary.
 9. Catch basins shall be provided by the contractor in an appropriate size to accommodate the pipe size, material, flow lines and arrangement as shown on the plans.
- 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.
 3. Steps: Not used.

- C. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for H-20, structural loading. Include flat grate with small square or short-slotted drainage openings. All grates shall be bicycle proof. Grates installed in pedestrian areas shall be heel proof as determined by the manufacturer.

1. Size: 24 by 24 inches minimum, unless otherwise indicated.
2. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

2.14 STORMWATER INLETS

- A. Gutter Inlets: Horizontal gutter opening, of materials and dimensions indicated. Include heavy-duty frames and grates. All grates to be bicycle safe.
- B. Combination Inlets: Vertical curb and horizontal gutter openings, of materials and dimensions indicated. Include heavy-duty frames and grates.

2.15 PIPE OUTLETS

- A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides.
- B. Riprap Basins: Broken, irregular size and shape, graded stone according to NSSGA's "Quarried Stone for Erosion and Sediment Control."
- C. Filter Stone: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. FS-2, No. 4 screen opening, average-size, graded stone.
- D. Energy Dissipaters: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. A-1, 3-ton average weight armor stone, unless otherwise indicated.

2.16 DRY WELLS

- A. Description: ASTM C 913, precast, reinforced, perforated concrete manholes with ring and cover, frame and grate, or lid as indicated and include the following:
1. Floor: Cast-in-place concrete support ring.
 2. Cover: Liftoff-type concrete cover with cast-in lift rings.
 3. Wall Thickness: 4 inches minimum with 1-inch diameter or 1-by-3-inch maximum slotted perforations arranged in rows parallel to axis of ring.
 - a. Total Free Area of Perforations: Approximately 15 percent of ring interior surface.
 - b. Ring Construction: Designed to be self-aligning.
 4. Filtering Material: ASTM D 448, Size No. 24, 3/4- to 2-1/2-inch washed, crushed stone or gravel. The % of material passing the # 200 sieve shall not exceed 5%.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.2 PIPING APPLICATIONS

- A. Pipe couplings and special pipe fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
 - 1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping, unless otherwise indicated.
 - a. Flexible or rigid couplings for same or minor difference OD pipes.
 - b. Unshielded, increaser/reducer-pattern, flexible or rigid couplings for pipes with different OD.
 - c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
 - 2. Use pressure-type pipe couplings for force-main joints.
- B. Special Pipe Fittings: Use for pipe expansion and deflection. Pipe couplings and special pipe fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
- C. Gravity-Flow, Nonpressure Sewer Piping: Use any of the following pipe materials for each size range:
 - 1. PVC water-service pipe; PVC Schedule 40, water-service-pipe fittings; and solvent-cemented joints.
 - 2. PVC sewer pipe and fittings; gaskets; and gasketed joints.
 - 3. Class [1] [2] [3], nonreinforced-concrete sewer pipe and fittings, gaskets, and gasketed joints.
 - 4. Ductile-iron culvert pipe, ductile-iron standard or compact fittings, gaskets, and gasketed joints.
 - 5. Reinforced-concrete sewer pipe and fittings, gaskets, and gasketed joints.
 - 6. Corrugated steel pipe and fittings, standard and special-joint bands, and banded joints.
 - 7. Corrugated aluminum pipe and fittings, standard and special-joint bands, and banded joints.
 - 8. Corrugated PE pipe and fittings, silttight couplings, and coupled joints.

3.3 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.
- F. Install gravity-flow, nonpressure drainage piping according to the following:
 - 1. Install piping pitched down in direction of flow, at slope indicated.
 - 2. Install piping with restrained joints at tee fittings and at changes in direction for pressure pipe. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
 - 3. Install piping with cover indicated.
 - 4. Notify engineer of clearance problems that would result in changes to grade and alignment.
 - 5. Install PVC cellular-core piping according to ASTM D 2321 and ASTM F 1668.
 - 6. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
 - 7. Install PVC profile gravity sewer piping according to ASTM D 2321 and ASTM F 1668.
 - 8. Install nonreinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
 - 9. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
- G. Install force-main pressure piping according to the following:
 - 1. Install piping with restrained joints at tee fittings and at horizontal and vertical changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
 - 2. Install piping with line and grade as indicated or below frost line if not indicated.
 - 3. Install PVC pressure piping according to AWWA M23 or ASTM D 2774 and ASTM F 1668.
 - 4. Install PVC water-service piping according to ASTM D 2774 and ASTM F 1668.

3.4 PIPE JOINT CONSTRUCTION

- A. Basic pipe joint construction is specified in Division 33 Section "Common Work Results for Utilities." Where specific joint construction is not indicated, follow piping manufacturer's written instructions.
- B. Join gravity-flow, nonpressure drainage piping according to the following:

1. Join PVC cellular-core piping according to ASTM D 2321 and ASTM F 891 for solvent-cement joints.
 2. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric gasket joints.
 3. Join PVC profile gravity sewer piping according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.
 4. Join nonreinforced-concrete sewer piping according to ASTM C 14 and ACPA's "Concrete Pipe Installation Manual" for rubber-gasket joints.
 5. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasket joints.
 6. Join dissimilar pipe materials with nonpressure-type flexible or rigid couplings.
- C. Join dissimilar pipe materials with pressure-type couplings.

3.5 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use same pipe type as sewer line that the cleanout is connected to. Install piping so cleanouts open in direction of flow in sewer pipe.
1. Use light-duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
 2. Use medium-duty, top-loading classification cleanouts in paved foot-traffic areas.
 3. Use heavy-duty, top-loading classification cleanouts in vehicle-traffic service areas.
 4. Use extra-heavy-duty, top-loading classification cleanouts in roads areas.
- B. Set cleanout frames and covers in earth in cast-in-place concrete block, 12 inches around outside of cover. At contractors option, a square block can be used that is at least 12-inches wider than the cover. Set with tops 1 inch above surrounding earth grade.
- C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

3.6 DRAIN INSTALLATION

- A. Install type of drains in locations indicated.
1. Use heavy-duty, top-loading classification drains in vehicle-traffic service areas, earth or unpaved foot-traffic areas and paved foot-traffic areas.
 2. Use extra-heavy-duty, top-loading classification drains in roads areas.
- B. Embed drains in 4-inch minimum depth of concrete around bottom and sides.
- C. Fasten grates to drains if indicated.
- D. Set drain frames and covers with tops flush with pavement surface.
- E. Assemble trench sections with flanged joints.
- F. Embed trench sections in 4-inch minimum concrete around bottom and sides.

3.7 MANHOLE INSTALLATION (Not Used)

3.8 CATCH BASIN INSTALLATION

- A. Construct catch basins in an appropriate size to accommodate the pipe size, material, flow lines and arrangement as shown on the plans.
- B. Set frames and grates to elevations indicated.
- C. Align boxes so that frame and grates are square to adjacent sidewalks, curbs or roadways.

3.9 STORMWATER INLET AND OUTLET INSTALLATION (Not Used)

3.10 DRAINAGE SYSTEM INSTALLATION (Not Used)

3.11 CONNECTIONS

- A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Division 22 Section "Facility Storm Drainage Piping."
- B. Connect force-main pressure piping to building's storm drainage force mains specified in Division 22 Section "Facility Storm Drainage Piping." Terminate piping where indicated.
 - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
 - 2. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.
- C. Connect to sediment interceptors specified in Division 22 Section "Sanitary Waste Interceptors."

3.12 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
 - 1. Close open ends of piping with at least 8-inch-thick, brick masonry bulkheads.
 - 2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

- B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:
 - 1. Remove manhole or structure and close open ends of remaining piping.
 - 2. Remove top of manhole or structure down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.
- C. Backfill to grade according to Division 31 Section "Earth Moving."

3.13 IDENTIFICATION

- A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
 - 1. Use warning tape or detectable warning tape over ferrous piping.
 - 2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.14 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.
 - a. Reports shall include a video log of storm drain showing all lineal footage of the system in DVD format. Log shall be submitted to the owner once a month. A final log shall be submitted with the as built drawing for the use of the owner and Architect.
 - 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.
5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
 - a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
 - b. Option: Test plastic piping according to ASTM F 1417.
 - c. Option: Test concrete piping according to ASTM C 924.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.15 CLEANING

A. Clean interior of piping of dirt and superfluous materials.

END OF SECTION 334100

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