PROJECT MANUAL

FOR

ITD BRINE MAKING FACILITY
SHOSHONE

OWNER
State of Idaho
Idaho Transportation Department
3311 State Street
Boise, Idaho  83707

JHS ARCHITECTS
125 N Garfield Ave
Pocatello, Idaho  83204
(208) 232-1223

DATE:  May 15, 2018
SECTION 000103 – PROJECT DIRECTORY

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Identification of project team members and their contact information.

1.02 OWNER:
   A. State of Idaho – Idaho Transportation Department – District #4
      5151 S. 5th Ave
      Pocatello, Idaho 83204
      (208) 239-3300

   B. Primary Contact:
      Shawn Webb
      (208) 886-7808 – office
      (208) 316-0470 – cell
      shawn.webb@itd.idaho.gov

1.03 Architect:
   JHS Architects
   125 N Garfield Ave
   Pocatello, Idaho 83204

   Primary Contact:
   Keeven Shropshire
   (208) 232-1223 – office
   keeven@jhsarchitects.com

1.04 Construction Manager:
   Petra, Incorporated
   1097 N. Rosario Street
   Suite 200
   Meridian, Idaho 83642

   Primary Contact:
   Roy Jackson
   (208) 323-4500 – office
   rjackson@petrainc.net

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LEGAL NOTICE ADVERTISEMENT FOR BID; The ITD (Idaho Transportation Department) is soliciting sealed proposals for Construction Services for

**Shoshone Brine Making Facility**

Proposals will be received at the Idaho Transportation Department Headquarters, Business and Support Management Building at 3311 State Street, Boise, Idaho 83707 on Tuesday, June 12th, 2018 at 11:00 AM Local Time.

A Pre-Bid Conference will be held at the Site, 216 S Date St. Shoshone, ID 83352 at 9:00 AM on Thursday May 31st, 2018 to discuss the work, address any concerns and provide opportunity to visually inspect the site and conditions of the work. Attendance is strongly encouraged. Bid Forms for the work are bound with the Project Manual.

Bidders are invited to attend a public bid opening where bids will be read aloud at the Idaho Transportation Department Headquarters, Business and Support Management Building at 3311 State Street, Boise, Idaho 83707, immediately following the closing time for receipt of bids. Owner reserves the right to reject any or all bids, or to waive informalities.

Bids must be accompanied by bid bond issued by an Idaho licensed surety company, or accompanied by a certified or cashier’s check from an Idaho Bank payable to the Owner in an amount not less than 5% of the total bid. This surety shall be forfeited by the Bidder should the Bidder fail to sign the contract or furnish the required 100% Performance and 100% Payment Bonds.


Bidder shall be licensed in the State of Idaho in accordance with Idaho State Public Works license law, Title 54 - Chapter 19 - Idaho Code Amended. Bidder shall comply with all Equal Employment Opportunity provisions required by federal regulations. Bidder shall be in compliance with State of Idaho Title 44 - Chapter 10, Idaho Code Amended as it relates to payment of wages and employment practices.
Instructions to Bidders

for the following PROJECT:
(Name and location or address)
Shoshone Brine Making Facility
Idaho Transportation Department
63 W. Highway 26
Shoshone, Idaho

THE OWNER:
(Name, legal status and address)
State of Idaho Transportation Department
3311 West State Street
Boise, Idaho 83707

THE ARCHITECT:
(Name, legal status and address)
JHS Architects
125 N. Garfield Avenue
Pocatello, Idaho 83204

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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 b:d 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 irregularities 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 description of the Work to be performed with the Bidder’s own forces;
   .2 names of the manufacturer, 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.
SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

The following supplements modify, change, delete from or add to the Instructions to Bidders, AIA Document A701, 1997 Edition. Where any Article of the Instruction to Bidders is modified or any Paragraph, Subparagraph or Clause thereof is modified or deleted by the Supplementary Instructions to Bidders, the unaltered provisions of that Article, Paragraph, Subparagraph or Clause shall remain in effect.

ARTICLE 3  BIDDING DOCUMENTS
Add to or supplement Article 3, with the following:
3.2.1.1 Where Owner can reasonably establish that a bidder has knowledge or and failed to report a material error, inconsistency, or inaccuracy, Owner may find bidder non-responsive or unresponsible.

ARTICLE 4  BIDDING PROCEDURES
Add to or supplement Article 4, with the following:
4.1.1 A photocopy of the form bound in the Project Manual or a modified form included in an addendum is acceptable.
4.1.7 A corporate seal is not required if not required by the state of incorporation.
4.1.8 Bidder shall be a legal resident of the United States of America and shall only employ legal residents.
4.1.8.1 If the Bidder is a corporation, partnership, sole proprietorship or other legal entity, and employs individual persons, by submitting its bid, the Bidder warrants that is does not knowingly hire or engage any illegal aliens or persons not authorized to work in the United States; it takes steps to verify that it does not hire or engage any illegal aliens or persons not authorized to work in the United States; and that any misrepresentation in this regard or any employment of persons not authorized to work in the United States constitutes a material beach and shall be cause for the imposition of monetary penalties and/or termination of any contract resulting from this bid; or
4.1.8.2 If the Bidder is a natural person eighteen (18) years of age or older,
   a. by submitting its bid, Bidder warrants that its bid is subject to Idaho Code section 67-7903 and, pursuant thereto, by submitting its bid, Bidder attests, under penalty of perjury, that it is a United State citizen or legal permanent resident or that it is otherwise lawfully present in the United State pursuant to federal law; and
   b. prior to being issued a contract, Bidder will be required to submit proof of lawful presence in the United State in accordance with Idaho Code section 67-7903.
4.1.9 Bids submitted must contain all original signatures in ink on all required forms, including the following:
   - Bid Proposal Form
   - Contractor’s Affidavit concerning Alcohol and Drug-Free Workplace
   - Bidders Acknowledgement Statement
   - Bid Bond

4.2.1 Delete the last sentence.
4.2.1.1 To be considered, proposals must be accompanied by an acceptable security in the amount not less than five (5) percent of the total amount of the bid including add alternates. The security may be in the form of a bond or certified or cashier’s check.
4.2.1.2 A successful bidder who fails to sign the contract for the work or furnish the required bonds within 10 days following the receipt of Notice of Intent to Award a Contract, shall forfeit the security. The Owner may then award the contract to the next lowest bidder.
4.2.2 A standard surety bid bond form meeting all the conditions of the AIA Document A310 is acceptable.
4.2.3.1 The specified time for retainage of the bid security is 45 days after the opening of bids, so long as the
bidder has not been notified of the acceptance of the bid.

4.3.1.1 The mailing envelope containing the bid shall be addressed as follows:

Idaho Transportation Department
P.O. Box 83720
Boise, Idaho 83720-0072
Attn: Tony Pirc – Bid Proposal/Shoshone Brine Making Facility

4.3.5 Along with his bid the bidder shall submit an affidavit certifying his compliance with Idaho Code, Title 72, Chapter 17, requiring the contractor and his subcontractors at the time of bid to provide a drug-free workplace program and to maintain such program throughout the duration of the contract.

4.3.6 Along with his bid the bidder shall submit an executed copy of the Bidder’s Acknowledgement Statement provided herein.

ARTICLE 5 CONSIDERATION OF BIDS
Add to Article 5, the following:

5.4 PUBLIC WORKS CONTRACTORS LICENSE
5.4.1 This Public Works project is not financed in whole or in part by Federal Aid Funds. Bid Proposals will be accepted from those contractors only (prime contractors, subcontractor, and/or specialty contractors) who, prior to the bid opening, hold current licenses as public works contractors in the State of Idaho.

5.5 EMPLOYMENT PRACTICES
5.5.1 Bids shall be based on the provisions of Section 44-1001 and 44-1002 of the Idaho Code dealing with labor preference.

5.6 NAMING OF SUBCONTRACTORS
5.6.1 Section 67-2310, Idaho Code, requires general (prime) contractors to include in their bid the name of the subcontractors who shall, in the event the contractor secures the contract, subcontract the plumbing, HVAC, and electrical work under the general prime contract. Failure to name subcontractors, as require, shall render any bid submitted by a general (prime) contractor unresponsive and void. Subcontractors named in accordance with the provisions of this section must possess an appropriate license or certificate of competency issued by the State of Idaho covering the contractor work classification in which the subcontractor is named.

The Idaho Transportation Department requires the bidder to complete Bid Proposal Page 2 in its entirety for all categories of work listed. The Idaho Transportation Department also requires that the general (prime) contractor name the entity that will perform the work, including if the entity is a subcontractor, a sub-subcontractor or the general (prime) contractor submitting the bid. Failure to complete Bid Proposal, Page 2 in full shall render a bid unresponsive and void.

With regard to possessing an appropriate license or certificate of competency all subcontractors listed by the general (prime) contractor must have at the time of the bid opening a current license in the appropriate category (class, type and specialty category) as issued by the Public Works Contractors State License Board. In addition, plumbing, HVAC and electrical subcontractors shall have at the time of the bid opening a valid plumbing contractor’s license, HVAC contractor’s license or electrical contractor’s license, respectively, as issued by the Idaho Division of Building Safety.

In determining if the above listed subcontractors are required on the project, the Idaho Transportation Department will refer to the plans and specifications. If doubt exists prior to bid
closing, potential bidders should contact the Idaho Transportation Department and the architect/engineer who prepare the plans and specifications will be requested to make the determination. If plumbing, HVAC, boiler, or electrical work in not shown on the plans and specifications, but is discovered by the bidder subsequent to the date of bid opening, then the bidder must request clarification form the architect/engineer. Absent such clarification, work will be considered incidental and naming of the subcontractor will not be required.

5.7 IDAHO DOMICILED CONTRACTORS

5.7.1 Section 67-2348, Idaho Code, requires the Idaho Transportation Department to apply a preference in determining which contractor submitted the lowest responsible bid. If the contractor who submitted the lowest dollar bid is domiciled in a state, which has preference law, which penalizes Idaho domiciled contractors then the Idaho Transportation Department must apply preference. The preference that will be applied is the preference of the domiciliary state of the contractor who submitted the lowest dollar bid.

Generally speaking, a contractor’s domiciliary state is the state in which the contractor’s home office is located. If federal fund are involved in the project then no preference will be used.

ARTICLE 6; POST BID INFORMATION

Delete paragraph 6.2

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

Modify and add to Article 7, the following:

In subparagraph 7.2.1, in the first sentence, delete “three days following the date of execution of the Contract”; and substitute “ten days following the receipt of Notice of Intent to Award”.

7.2.2.1 Performance bond and labor and material payment bond are required for this project; each in an amount of not less than 100% of the contract amount, and issued by a surety company authorized to do business in Idaho.

END OF SUPPLEMENTARY INSTRUCTIONS TO BIDDERS
BID PROPOSAL

Gentlemen:

The Bidder, in compliance with your invitation for bids for the construction of the Idaho Transportation Department Brine Making Facility #18-406, Shoshone, Idaho having examined the specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials and supplies, and to provide the service and insurance in accordance with the Contract Documents, within the time set forth therein, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

Bidder hereby agrees to commence work under this contract on or before a date to be specified in written “Notice to Proceed” of the Owner and to substantially complete the project within __120__ consecutive calendar days thereafter, as stipulated in the specifications. Bidder further agrees to pay as liquidated damages, the sum of $100 for each consecutive calendar day thereafter as hereinafter provided in Paragraph 9.11.1 of the Supplementary Conditions.

Bidder acknowledges receipt of addenda No. ______________________.

BASE PROPOSAL: Bidder agrees to perform all of the base proposal work described in the specifications and shown on the plans for the sum of ________________ Dollars ($__________). (Amount shall be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.)

Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

The bidder agrees that this bid shall be good and may not be withdrawn for a period of 60 calendar days after the scheduled closing time for receiving bids.

Upon receipt of written notice of the acceptance of this bid, Bidder will execute the formal contract within ten (10) calendar days and deliver a Surety Bond or Bonds as required by paragraph “Performance and Payment Bonds”.

The bid security attached in the amount of 5% of the bid amount is to become the property of the Owner in the event the contract and bond are not executed within the time set forth, as liquidated damages for the delay and additional expense to the Owner caused thereby.

The names and addresses of the entities who will perform the Work identified below, subject to approval of Owner and Architect, if Undersigned is awarded the Contract, are as follows:
Plumbing (PWCL Category 15400)
(Name) ________________________________
(Address) ________________________________
Idaho Public Works Contractors License No. ________________
Idaho Plumbing Contractors License No. ________________

Heating, Ventilating & Air Conditioning (PWCL Category 15700-HVAC)
(Name) ________________________________
(Address) ________________________________
Idaho Public Works Contractors License No. ________________
Idaho HVAC Contractors License No. ________________

Electrical (PWCL Category 16000)
(Name) ________________________________
(Address) ________________________________
Idaho Public Works Contractors License No. ________________
Idaho Electrical Contractors License No. ________________

FAILURE TO NAME A PROPERLY LICENSED SUBCONTRACTOR IN EACH OF THE ABOVE CATEGORIES WILL RENDER THE BID UNRESPONSIVE AND VOID.

Should the listing of subcontractors change due to selection of alternates or other similar circumstances, attach explanation.

Bidder warrants that bid has been prepared and that any contract resulting from acceptance of this bid is subject to the Fixed Price Construction Contract.

The undersigned notifies that it is of this date duly licensed as an Idaho Public Works Contractor and further that it possesses Idaho Public Works Contractor's License No. __________________________, and is domiciled in the State of __________________________.

Dated this ________ day of __________, ________.
(date) (month) (year)

Respectfully submitted by:

(Contractor’s Name- Typed)

(SEAL)
(Seal - if bid is by a corporation)

__________________________
(Street or PO Address)

__________________________
(City, State and zip code)

__________________________
(Authorized Signature)
Have you remembered to include bid security (bid bond or a certified or cashier’s check), Contractor’s Affidavit Concerning Taxes and a signed copy of the Bidder’s Acknowledgment Statement with your bid?
CONTRACTOR’S AFFIDAVIT
CONCERNING ALCOHOL AND DRUG-FREE WORKPLACE

STATE OF ________________________
COUNTY OF ________________________

Pursuant to the Idaho Code, Section 72-1717, I, the undersigned, being duly sworn, depose and certify that ___________________________________ is in compliance with the provisions of Idaho Code section 72-1717; that ___________________________________ provides a drug-free workplace program that complies with the provisions of Idaho Code, title 72, chapter 17 and will maintain such program throughout the life of a state construction contract and that ___________________________________ shall subcontract work only to subcontractors meeting the requirements of Idaho Code, section 72-1717(1)(a).

__________________________________________
Name of Contractor

__________________________________________
Address

__________________________________________
City and State

By: ______________________________________
(Signature)

Subscribed and sworn to before me this ______________ day of ________________, ______.

Commission expires:

__________________________________________
NOTARY PUBLIC, residing at

________________________________________________________________________

FAILURE TO EXECUTE THIS AFFIDAVIT AND SUBMIT IT ALONG WITH YOUR BID SHALL MAKE YOUR BID NON-RESPONSIVE.

CONTRACTOR’S AFFIDAVIT
ON ALCOHOL AND DRUG-FREE WORKPLACE

BOILR-2005 CM revised 02/27/17

(18-305)
(May, 2018)
BIDDER’S ACKNOWLEDGEMENT STATEMENT

NOTE: THE INFORMATION CONTAINED HEREIN IS A SUMMARY OF VITAL CONTRACT PROVISIONS AND DOES NOT CHANGE THE CONTRACT DOCUMENTS THAT WILL GOVERN THIS PROJECT.

Idaho Transportation Department Project No. 18-406

By submitting a bid for this project, the undersigned bidder agrees that, if awarded the contract for construction, Contractor will conform to all conditions and requirements of the contract, including but not limited to:

- Contractor agrees to comply with subparagraph 13.1.3 of the Supplementary Conditions pertaining to Sections 44-1001 and 44-1002, Idaho Code requiring the employment of 95% bona fide Idaho residents and providing for a preference in the employment of bona fide Idaho residents and regarding the employment of persons not authorized to work in the United States.

- Contractor will substantially complete the work within the time stated in the contract documents, or as modified by Change Order.

- If the Contractor fails to substantially complete the Project within the time stated in the contract documents, or as modified by Change Order, the Contractor agrees that the Owner may deduct from the contract amount liquidated damages in the amount per calendar day indicated in the Contract Documents times the number of calendar days until the project is Substantially Complete, as defined in the Contract Documents and as determined by the Architect (or Engineer).

- The Contractor agrees that the amount allowed for overhead and profit on any Change Order is limited to the amounts indicated in paragraph 7.3.10 of the General Conditions of the Contract for Construction, as supplemented, which are stated below.

  1. for total changes of $10,000 or less in direct cost, the amount allowed for overhead, profit, bonds and insurance for the Contractor and all subcontractors of any tier combined shall not exceed twenty percent (20%) of direct costs.

  2. for total changes exceeding $10,000 in direct cost, the amount allowed for overhead, profit, bonds and insurance for the Contractor and all subcontractors of any tier combined shall not exceed fifteen percent (15%) of direct costs.

  3. the Contractor will determine the amount of overhead and profit to be apportioned between the Contractor and its subcontractor of allowable amounts of overhead, profit, bonds and insurance.

- The Contractor agrees that Change Orders are governed by the General Conditions of the Contract for Construction, as supplemented, including but not limited to Section 7.2.3 and Section 7.2.4 of the Supplementary Conditions.
By the execution of a Change Order, the Contractor agrees and acknowledges that he has had sufficient
time and opportunity to examine the change in work which is the subject of the Change Order and that he
has undertaken all reasonable efforts to discover and disclose any concealed or unknown conditions
which may to any extent affect the Contractor’s ability to perform in accordance with the Change Order.
Aside from those matters specifically set forth in the Change Order, the Owner shall not be obligated to
make any adjustments to either the Contract Sum or Contract Time by reason of any conditions affecting
the change in work addressed by the Change Order that could have reasonably been discovered or
disclosed by the Contractor’s examination.

Any Change Order fully executed by the Owner, Contractor and Architect (or Engineer), including but not
limited to a Change Order arising by reason of the parties’ mutual agreement or by mediation, shall
constitute a final and full settlement of all matters relating to or affected by the change in the Work,
including but not limited to, all direct and consequential costs associated with such change and any and
all adjustments to the Contract Sum and Contract Time. In the event a Change Order increases the
Contract Sum, the Contractor shall include the work covered by such Change Order in the Application for
Payment as if such work were originally part of the Project and Contract Documents.

FAILURE TO EXECUTE THIS ACKNOWLEDGEMENT WILL MAKE THE BID NONRESPONSIVE.

I, ____________________________________________, being duly authorized to bind the bidder
(type or print name of individual)
___________________________________________________________,
does hereby certify that
(type or print name of company)
_______________________________________________________has fully read and
understands this document and that it highlights certain parts of the contract that will be entered between
the parties and that will govern this Project.

Signed: ________________________________
Title: __________________________
Date: ____________

END OF BIDDER’S ACKNOWLEDGEMENT STATEMENT
REQUEST FOR TAX RELEASE

Date: _________________

RE: ITD Project Number: 18-406

Project Name: Shoshone Brine Making Facility
State Agency: Idaho Transportation Department

Contractor Requesting Release – Name: ____________________________________________
Address: ________________________________________________________________

Contact Name: __________________________ Telephone Number: _______________

Federal Employer Identification No.: __________________________________________

Project Information:
Project is Complete: _________________________________________________________
Project is Substantially Complete: _____________________________________________
Project Start Date: ___________________________________________________________
Project Complete Date: _______________________________________________________
Final Contract Amount (including change orders): _________________________________

Did any public works or other governmental agency supply materials, which were installed by this contractor or his subcontractors?  Yes ________ No ________

If yes, list these materials and their dollar values: ________________________________

________________________________________

Section 004328
To request a Tax Release, please send this form to:

Attn: Contract Desk; Sales Tax Audit; Idaho State Tax Commission; PO Box 36; Boise, ID 83722
SECTION 005000 - CONTRACTING FORMS AND SUPPLEMENTS

PART 1  GENERAL

1.01 CONTRACTOR IS RESPONSIBLE FOR OBTAINING A VALID LICENSE TO USE ALL COPYRIGHTED DOCUMENTS SPECIFIED BUT NOT INCLUDED IN THE PROJECT MANUAL.

1.02 AGREEMENT AND CONDITIONS OF THE CONTRACT

A. See Section 007200 - General Conditions for the General Conditions.
B. See Section 007300 - Supplementary Conditions for the Supplementary Conditions.
C. The Agreement is based on AIA A132/CMA.
D. The General Conditions are based on AIA A232/CMA.

1.03 FORMS

A. Use the following forms for the specified purposes unless otherwise indicated elsewhere in the Contract Documents.
B. Bond Forms:
   1. Bid Bond Form: AIA A310.
   2. Performance and Payment Bond Form: AIA A312.
C. Post-Award Certificates and Other Forms:
      a. Supplemental Attachment: AIA G715
   2. Application for Payment Forms: AIA G732, AIA G736 and AIA G737 (for Construction Manager as Adviser to compile and summarize contractor's application and certificate for payment).
D. Clarification and Modification Forms:
   1. Construction Change Directive Form (for Construction Manager as Adviser): AIA G714/CMA.
   2. Change Order Form (for Construction Manager as Adviser): AIA G701/CMA.
E. Closeout Forms:
   1. Certificate of Substantial Completion Form (for Construction Manager as Adviser): AIA G704/CMA.

1.04 REFERENCE STANDARDS

A. AIA A132 - Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition; 2009.
C. AIA A310 - Bid Bond; 2010.
D. AIA A312 - Performance Bond and Payment Bond; 2010.
J. AIA G736 - Project Application and Project Certificate for Payment, Construction Manager as Adviser Edition; 2009.
K. AIA G737 - Summary of Contractors' Applications for Payment, Construction Manager as Adviser Edition; 2009.
PART 2 PRODUCTS - NOT USED
PART 3 EXECUTION - NOT USED

END OF SECTION 005000
SECTION 005200 - AGREEMENT FORM

PART 1 GENERAL

1.01 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

A. AIA Document A132/CMa, 2009 Edition, Standard Form of Agreement Between Owner and Contractor - Construction Manager-Adviser Edition will be used as the agreement for this project. Copies of AIA Document A132/CMa are available for review at the offices of the Owner, Architect, and Construction Manager. Copies of the document may be purchased from the American Institute of Architects or its local distributors.

1.02 RELATED REQUIREMENTS

A. Section 007200 - General Conditions.
B. Section 007300 - Supplementary Conditions.
C. Section 014216 - Definitions.

1.03 MODIFICATIONS TO THE AGREEMENT FORM

A. ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

1. 3.1 The date of commencement will be fixed by issuance of a "Notice of Intent to Award" and a "Notice to Proceed". Delete the last sentence of paragraph 3.1.
2. 3.2 Liquidated damages will be included as provided in the Supplementary Conditions.

B. ARTICLE 5 PAYMENTS

1. In paragraph 5.2, delete "as follows:" and replace with "a day agreed upon by the Owner and Contractor."
2. Delete paragraph 5.3 and substitute the following:
3. 5.3 Provided that an application for payment is received by the Construction Manager on the established date, the Owner shall make payment to the Contractor not later than 21 days from receipt by the Owner of the certification by the Construction Manager.
4. In subparagraphs 5.6.1 and 5.6.2 Retainage will be five percent (5%) for work completed and material suitably stored.
5. In subparagraph 5.6.1, delete the last sentence. Delete subparagraphs 5.7.1, 5.7.2 and paragraph 5.8.
6. No reduction in retainage will be allowed prior to final completion without written approval of the Owner. Refer to Supplementary Condition 9.6.1.1.
7. Add new paragraph 5.9;
8. 5.9 A condition will be included forbidding more retainage from a subcontractor or supplier than retained from their portion of the work.

C. ARTICLE 7 MISCELLANEOUS PROVISIONS

1. 7.2 Will be modified to agree with paragraph 13.6.1 of the Supplementary Conditions.
2. 7.4.1 Contractor warrants that it does not knowingly hire or engage any illegal aliens or persons not authorized to work in the United States; it takes steps to verify that it does not hire or engage any illegal aliens or persons not authorized to work in the United States; and that any misrepresentation in this regard or any employment of persons not authorized to work in the United States constitutes a material breach and shall be cause for the imposition of monetary penalties not to exceed five percent (5%) of the total Contract Amount per violation and/or termination of this contract.

D. ARTICLE 8 TERMINATION OR SUSPENSION

1. Add to both paragraphs 8.1 and 8.2 "as modified by the Supplementary Conditions."

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 005200
State of Idaho  
Department of Administration  
Division of Public Works  

CONTRACTOR'S AFFIDAVIT CONCERNING TAXES  

STATE OF IDAHO  
COUNTY OF ADA  

Pursuant to the Idaho Code, Title 63, Chapter 15, I, the undersigned, being duly sworn, depose and certify that all taxes, excises and license fees due to the State or its taxing units, for which I or my property is liable then due or delinquent, has been paid, or arrangements have been made, before entering into a contract for construction of any public works in the State of Idaho.

______________________________
Name of Contractor

______________________________
Address

______________________________
City and State

______________________________
(Signature)

By: __________________________________________________________________________

Subscribed and sworn to before me this ____________ day of ________________________

Commission expires: ______________________________________________________________________

____________________________________________________________________________________

NOTARY PUBLIC, residing at

____________________________________________________________________________________

____________________________________________________________________________________

CONTRACTOR'S AFFIDAVIT

BOILR-2005 CM revised 02/27/17

CA - 1

(18-305)
(May, 2018)
General Conditions of the Contract for Construction, Construction Manager as Adviser Edition

for the following PROJECT:
(Name, and location or address)

Shoshone Brine Making Facility
Idaho Transportation Department
63 W. Highway 26
Shoshone, Idaho

THE CONSTRUCTION MANAGER:
(Name, legal status and address)

Petra, Incorporated
1097 N. Rosario Street, Suite 200
Meridian, Idaho 83642

THE OWNER:
(Name, legal status and address)

State of Idaho Transportation Department
3311 West State Street
Boise, Idaho 83707

THE ARCHITECT:
(Name, legal status and address)

JHS Architects
125 N. Garfield Avenue
Pocatello, Idaho 83204

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 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.

This document is intended to be used in conjunction with AIA Documents A132™—2009, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition; B132™—2009, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™—2009, Standard Form of Agreement Between Owner and Construction Manager as Adviser.
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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 the Contractor, 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 the Construction Manager or the Construction Manager's consultants, (3) between the Owner and the Architect or the Architect's consultants, (4) between the Contractor and the Construction Manager or the Construction Manager's consultants, (5) between the Owner and a Subcontractor or Sub-subcontractor (6) between the Construction Manager and the Architect, or (7) between any persons or entities other than the Owner and Contractor. The Construction Manager and Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of their 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 other Multiple Prime Contractors and by the Owner's own forces, including persons or entities under separate contracts not administered by the Construction Manager.

§ 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 Inten 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, 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 Article 4, the Construction Manager and the Architect do 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. Unless otherwise provided under the Contract Documents, the Owner, through the Construction Manager, shall secure and pay for the building permit.

§ 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.

§ 2.2.6 The Owner shall endeavor to forward all communications to the Contractor through the Construction Manager and shall contemporaneously provide the same communications to the Architect about matters arising out of or relating to the Contract Documents.

§ 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 Construction Manager’s and Architect’s and their respective consultants’ 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, after consultation with the Construction Manager. 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 plural term "Multiple Prime Contractors" refers to persons or entities who perform construction under contracts with the Owner that are administered by the Construction Manager. The term does not include the Owner's own forces, including persons or entities under separate contracts not administered by the Construction Manager.
§ 3.1.3 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.4 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 Construction Manager or Architect in their 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 Construction Manager and Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information submitted to the Construction Manager in such form as the Construction Manager and 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 Construction Manager and Architect any nonconformity discovered by or made known to the Contractor as a request for information submitted to Construction Manager in such form as the Construction Manager and 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 instruction 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, the Construction Manager, and the Architect and shall not proceed with that portion of the Work without further written instructions from the Architect, through the Construction Manager. 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 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 the Project 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 3.1.2.8 or 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect, in consultation with the Construction Manager, 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, Construction Manager, 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 with 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 Construction Manager or 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 or portions thereof 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 Owner, through the Construction Manager, shall secure and pay for the building permit. The Contractor shall secure and pay 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, Construction Manager, and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect and Construction
Manager will promptly investigate such conditions and, if the Architect, in consultation with the Construction Manager, 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, in consultation with the Construction Manager, 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, Construction Manager, and Contractor in writing, stating the reasons. If the Owner or Contractor disputes the Architect’s determination or recommendation, either 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, Construction Manager, 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 and Architect through the Construction Manager, the name and qualifications of a proposed superintendent. The Construction Manager may reply within 14 days to the Contractor in writing stating (1) whether the Owner, the Construction Manager, or the Architect has reasonable objection to the proposed superintendent or (2) that any of them require additional time to review. Failure of the Construction Manager 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, Construction Manager 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 and the Construction Manager’s approval 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 schedule to the extent required by the Contract Documents, and shall provide for expedient and practicable execution of the Work.
The Contractor shall cooperate with the Construction Manager in scheduling and performing the Contractor's Work to avoid conflict with, and as to cause no delay in, the work or activities of other Multiple Prime Contractors or the construction or operations of the Owner's own forces.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter update it as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Construction Manager's and Architect's approval. The Architect and Construction Manager'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 Construction Manager and 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 participate with other Contractors, the Construction Manager and Owner in reviewing and coordinating all schedules for incorporation into the Project schedule that is prepared by the Construction Manager. The Contractor shall make revisions to the construction schedule and submittal schedule as deemed necessary by the Construction Manager to conform to the Project schedule.

§ 3.10.4 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner, Construction Manager and Architect and incorporated into the approved Project schedule.

§ 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 documents shall be available to the Architect and delivered to the Construction Manager 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 and Construction Manager is subject to the limitations of Sections 4.2.9 through 4.2.11. Informational submittals upon which the Construction Manager and Architect are 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 Construction Manager or Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Construction Manager Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the Project submittal schedule approved by the Construction Manager and Architect, or in the absence of an approved Project submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of other Multiple Prime Contractors or the Owner's own forces. The Contractor shall cooperate with the Construction Manager in the coordination of the Contractor's Shop Drawings, Product Data, Samples and similar submittals with related documents submitted by other Multiple Prime Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner, Construction Manager, 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 reviewed and 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 Construction Manager and 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 Construction Manager and 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 relate 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
§ 3.13.1 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.

§ 3.13.2 The Contractor shall coordinate the Contractor's operations with, and secure the approval of, the Construction Manager before using any portion of the site.

§ 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's own forces or of other Multiple Prime 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's own forces or by other Multiple Prime Contractors except with written consent of the Construction Manager.
Owner and such other Multiple Prime Contractors; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the other Multiple Prime Contractors or the Owner 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, or Construction Manager with the Owner’s approval, may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work
The Contractor shall provide the Owner, Construction Manager 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, Construction Manager 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, Architect, or Construction Manager. 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 through the Construction Manager.

§ 3.18 Indemnification
§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Construction Manager, Architect, Construction Manager’s and 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 that 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 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 AND CONSTRUCTION MANAGER
§ 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 singular in number.

§ 4.1.2 The Owner shall retain a construction manager lawfully licensed to practice construction management or an entity lawfully practicing construction management in the jurisdiction where the Project is located. That person or entity is identified as the Construction Manager in the Agreement and is referred to throughout the Contract Documents as singular in number.
§ 4.1.3 Duties, responsibilities and limitations of authority of the Construction Manager and Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Construction Manager, Architect and Contractor. Consent shall not be unreasonably withheld.

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

§ 4.2 Administration of the Contract
 § 4.2.1 The Construction Manager and Architect will provide administration of the Contract as described in the Contract Documents and will be the Owner’s representatives during construction until the date the Architect issues the final Certificate for Payment. The Construction Manager and 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. 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 and Construction Manager (1) known deviations from the Contract Documents and from the most recent Project schedule prepared by the Construction Manager, and (2) defects and deficiencies observed in the Work.

§ 4.2.3 The Construction Manager shall provide a staffing plan to include one or more representatives who shall be in attendance at the Project site whenever the Work is being performed. The Construction Manager will determine in general if the Work observed is being performed in accordance with the Contract Documents, will keep the Owner reasonably informed of the progress of the Work, and will report to the Owner and Architect (1) known deviations from the Contract Documents and the most recent Project schedule, and (2) defects and deficiencies observed in the Work.

§ 4.2.4 The Construction Manager will schedule and coordinate the activities of the Contractor and other Multiple Prime Contractors in accordance with the latest approved Project schedule.

§ 4.2.5 The Construction Manager, except to the extent required by Section 4.2.4, and Architect will not have control over, or charge of, 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, and neither will be responsible for the Contractor’s failure to perform the Work in accordance with the requirements of the Contract Documents. Neither the Construction Manager nor the Architect will have control over or charge of or be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or of any other persons or entities performing portions of the Work.

§ 4.2.6 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 Construction Manager, and shall contemporaneously provide the same communications to the Architect about matters arising out of or relating to the Contract Documents. 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 other Multiple Prime Contractors shall be through the Construction Manager and shall be contemporaneously provided to the Architect if those communications are about matters arising out of or related to the Contract Documents. Communications by and with the Owner’s own forces shall be through the Owner.

§ 4.2.7 The Construction Manager and Architect will review and certify all Applications for Payment by the Contractor, in accordance with the provisions of Article 9.

§ 4.2.8 The Architect and Construction Manager have authority to reject Work that does not conform to the Contract Documents and will notify each other about the rejection. The Construction Manager shall determine in general
whether the Work of the Contractor is being performed in accordance with the requirements of the Contract Documents and notify the Owner, Contractor and Architect of defects and deficiencies in the Work. Whenever the Construction Manager considers it necessary or advisable, the Construction Manager will have authority to require additional inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, upon written authorization of the Owner, whether or not such Work is fabricated, installed or completed. The foregoing authority of the Construction Manager will be subject to the provisions of Sections 4.2.18 through 4.2.20 inclusive, with respect to interpretations and decisions of the Architect. However, neither the Architect’s nor the Construction Manager’s authority to act under this Section 4.2.8 nor a decision made by either of them in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect or the Construction Manager to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons performing any of the Work.

§ 4.2.9 The Construction Manager will receive and promptly review for conformance with the submittal requirements of the Contract Documents, all submittals from the Contractor such as Shop Drawings, Product Data and Samples. Where there are Multiple Prime Contractors, the Construction Manager will also check and coordinate the information contained within each submittal received from Contractor and other Multiple Prime Contractors, and transmit to the Architect those recommended for approval. By submitting Shop Drawings, Product Data, Samples and similar submittals, the Construction Manager represents to the Owner and Architect that the Construction Manager has reviewed and recommended them for approval. The Construction Manager’s actions will be taken in accordance with the Project submittal schedule approved by the Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness while allowing sufficient time to permit adequate review by the Architect.

§ 4.2.10 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. Upon the Architect’s completed review, the Architect shall transmit its submittal review to the Construction Manager.

§ 4.2.11 Review of the Contractor’s submittals by the Construction Manager and Architect 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 Construction Manager and 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 Construction Manager and Architect’s review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Construction Manager and 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.

§ 4.2.12 The Construction Manager will prepare Change Orders and Construction Change Directives.

§ 4.2.13 The Construction Manager and the Architect will take appropriate action on Change Orders or Construction Change Directives in accordance with Article 7 and the Architect will have authority to order minor changes in the Work as provided in Section 7.4. The Architect, in consultation with the Construction Manager, will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.14 Utilizing the documents provided by the Contractor, the Construction Manager will maintain at the site for the Owner one copy of all Contract Documents, approved Shop Drawings, Product Data, Samples and similar required submittals, in good order and marked currently to record all changes and selections made during construction. These will be available to the Architect and the Contractor, and will be delivered to the Owner upon completion of the Project.

§ 4.2.15 The Construction Manager will assist the Architect in conducting inspections to determine the dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion in conjunction with the Architect pursuant to Section 9.8; and receive and forward to the Owner written warranties and related
documents required by the Contract and assembled by the Contractor pursuant to Section 9.10. The Construction Manager will forward to the Architect a final Application and Certificate for Payment or final Project Application and Project Certificate for Payment upon the Contractor's compliance with the requirements of the Contract Documents.

§ 4.2.16 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.

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

§ 4.2.18 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 so rendered in good faith.

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

§ 4.2.20 The Construction Manager will receive and review requests for information from the Contractor, and forward each request for information to the Architect, with the Construction Manager's recommendation. The Architect will review and respond in writing to the Construction Manager to requests for information about the Contract Documents. The Construction Manager's recommendation and the Architect's response to each request 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 other Multiple Prime Contractors or subcontractors of other Multiple Prime Contractors.

§ 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 Construction Manager for review by the Owner, Construction Manager and 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 Construction Manager may reply within 14 days to the Contractor in writing stating (1) whether the Owner, the Construction Manager or the Architect has reasonable objection to any such proposed person or entity or, (2) that the Construction Manager, Architect or Owner requires additional time for review. Failure of the Construction Manager, 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, Construction Manager 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, Construction Manager or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner, Construction Manager 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, Construction Manager 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 responsibility for safety of the Subcontractor’s Work, which the Contractor, by these Documents, assumes toward the Owner, Construction Manager and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner, Construction Manager 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 OTHER CONTRACTORS
§ 6.1 Owner’s Right to Perform Construction with Own Forces and to Award Other Contracts
§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner’s own forces, which include persons or entities under separate contracts not administered by the Construction Manager, and to award other 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 the Owner performs construction or operations with the Owner’s own forces including persons or entities under separate contracts not administered by the Construction Manager, the Owner shall provide for coordination of such forces with the Work of the Contractor, who shall cooperate with them.
§ 6.1.3 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’s own forces, Construction Manager and other Multiple Prime 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’s own forces or other Multiple Prime Contractors, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Construction Manager and 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 own forces or other Multiple Prime Contractors’ 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, including costs that are payable to a separate contractor or to her Multiple Prime Contractors 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 delays, improperly timed activities, damage to the Work or defective construction by the Owner’s own forces or other Multiple Prime Contractors.

§ 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, separate contractors, or other Multiple Prime Contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner and other Multiple Prime Contractors 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, other Multiple Prime 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 Construction Manager, with notice to 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, Construction Manager, Architect and Contractor; a Construction Change Directive requires agreement by the Owner, Construction Manager 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
A Change Order is a written instrument prepared by the Construction Manager and signed by the Owner, Construction Manager, Architect and Contractor, stating their agreement upon all of the following:

1. The change in the Work;
§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Construction Manager and signed by the Owner, Construction Manager 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 Construction Manager and 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 Construction Manager 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, the Contractor shall keep and present, in such form as the Construction Manager 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 Construction Manager and Architect.
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 Construction Manager and Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Construction Manager and Architect determine to be reasonably justified. The 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 Construction Manager and 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 Construction Manager shall 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 issued through the Construction Manager 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, Owner's own forces, Construction Manager, Architect, any of the other Multiple Prime Contractors or an employee of any of them, 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, based on the recommendation of the Construction Manager, 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 Construction Manager, 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 Construction Manager and Architect may require. This schedule, unless objected to by the Construction Manager or Architect, shall be used as a basis for reviewing the Contractor’s Applications for Payment. In the event there is one Contractor, the Construction Manager shall forward to the Architect the Contractor’s schedule of values. If there are Multiple Prime Contractors responsible for performing different portions of the Project, the Construction Manager shall forward the Multiple Prime Contractors’ schedules of values only if requested by the Architect.

§ 9.3 Applications for Payment
§ 9.3.1 At least fifteen days before the date established for each progress payment, the Contractor shall submit to the Construction Manager 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, Construction Manager 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 Construction Manager and 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 Where there is only one Contractor, the Construction Manager will, within seven days after the Construction Manager’s receipt of the Contractor’s Application for Payment, review the Application, certify the amount the Construction Manager determines is due the Contractor, and forward the Contractor’s Application and Certificate for Payment to the Architect. Within seven days after the Architect receives the Contractor’s Application for Payment from the Construction Manager, the Architect will either issue to the Owner a Certificate for Payment, with a copy to the Construction Manager, for such amount as the Architect determines is properly due, or notify the Construction Manager and Owner in writing of the Architect’s reasons for withholding certification in whole or in part as provided

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in Section 9.5.1. The Construction Manager will promptly forward to the Contractor the Architect’s notice of withholding certification.

§ 9.4.2 Where there are Multiple Prime Contractors performing portions of the Project, the Construction Manager will, within seven days after the Construction Manager receives the Multiple Prime Contractors’ Applications for Payment: (1) review the Applications and certify the amount the Construction Manager determines is due each of the Multiple Prime Contractors; (2) prepare a Summary of Contractors’ Applications for Payment by combining information from each Multiple Prime Contractors’ application with information from similar applications for progress payments from other Multiple Prime Contractors; (3) prepare a Project Application and Certificate for Payment; (4) certify the amount the Construction Manager determines is due all Multiple Prime Contractors; and (5) forward the Summary of Contractors’ Applications for Payment and Project Application and Certificate for Payment to the Architect.

§ 9.4.3 Within seven days after the Architect receives the Project Application and Project Certificate for Payment and the Summary of Contractors’ Applications for Payment from the Construction Manager, the Architect will either issue to the Owner a Project Certificate for Payment, with a copy to the Construction Manager, for such amount as the Architect determines is properly due, or notify the Construction Manager and Owner in writing of the Architect’s reasons for withholding certification in whole or in part as provided in Section 9.5.1. The Construction Manager will promptly forward the Architect’s notice of withholding certification to the Contractors.

§ 9.4.4 The Construction Manager’s certification of an Application for Payment or, in the case of Multiple Prime Contractors, a Project Application and Certificate for Payment shall be based upon the Construction Manager’s evaluation of the Work and the information provided as part of the Application for Payment. The Construction Manager’s certification will constitute a representation that, to the best of the Construction Manager’s knowledge, information and belief, the Work has progressed to the point indicated and the quality of the Work is in accordance with the Contract Documents. The certification will also constitute a recommendation to the Architect and Owner that the Contractor be paid the amount certified.

§ 9.4.5 The Architect’s issuance of a Certificate for Payment or in the case of Multiple Prime Contractors, Project Application and Certificate for Payment, shall be based upon the Architect’s evaluation of the Work, the recommendation of the Construction Manager, and information provided as part of the Application for Payment or Project Application for Payment. The Architect’s certification will constitute a representation that, to the best of the Architect’s knowledge, information and belief, the Work has progressed to the point indicated, that the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified.

§ 9.4.6 The representations made pursuant to Sections 9.4.4 and 9.4.5 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 Construction Manager or Architect.

§ 9.4.7 The issuance of a separate Certificate for Payment or a Project Certificate for Payment will not be a representation that the Construction Manager or Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed the Contractor’s 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 Construction Manager or Architect may withhold a Certificate for Payment or Project Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Construction Manager’s or Architect’s opinion the representations to the Owner required by Section 9.4.4 and 9.4.5 cannot be made. If the Construction Manager or Architect is unable to certify payment in the amount of the Application, the Construction Manager will notify the Contractor and Owner as provided in Section 9.4.1 and 9.4.3. If the Contractor, Construction Manager and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment or a Project Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Construction Manager or Architect may also withhold a Certificate for Payment or, because of

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subsequently discovered evidence or subsequent observations, may nullify the whole or a part of a Certificate for Payment or Project Certificate for Payment previously issued, to such extent as may be necessary in the Construction Manager’s or Architect’s opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from the 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 or Construction Manager withholds certification for payment under Section 9.5.1, 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 Construction Manager and both 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 or Project 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 Construction Manager and 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 Construction Manager 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 Owner, Construction Manager and Architect 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, Construction Manager 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

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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 Construction Manager and Architect do not issue a Certificate for Payment or a Project Certificate for Payment, through no fault of the Contractor, within fourteen days after the Construction Manager’s 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 Construction Manager and Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days’ written notice to the Owner, Construction Manager 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 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 notify the Construction Manager, and the Contractor and Construction Manager shall jointly 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 list, the Architect, assisted by the Construction Manager, 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 list, which is not sufficiently complete in accordance with the requirements of 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, assisted by the Construction Manager, to determine Substantial Completion.

§ 9.8.4 When the Architect, assisted by the Construction Manager, determines that the Work or designated portion thereof is substantially complete, the Construction Manager will prepare, and the Construction Manager and Architect shall execute 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 and Construction Manager shall jointly 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 after consultation with the Construction Manager.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contract Manager, 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 completion of the Work, the Contractor shall forward to the Construction Manager a written notice that the Work is ready for final inspection and acceptance and shall also forward to the Construction Manager a final Contractor's Application for Payment. Upon receipt, the Construction Manager will evaluate the completion of Work of the Contractor and then forward the notice and Application, with the Construction Manager’s recommendations, to the Architect who will promptly make such inspection. When the Architect, finds the Work acceptable under the Contract Documents and the Contract fully performed, the Construction Manager and Architect will promptly issue a final Certificate for Payment or Project Certificate for Payment stating that to the best of their knowledge, information and belief, and on the basis of their 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 Construction Manager and Architect’s final Certificate for Payment or Project 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 through the Construction Manager (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 Construction Manager and Architect so confirm, the Owner shall, upon application by the Contractor and certification by the Construction Manager and 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 the 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 through the Construction Manager 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. The Contractor shall submit the Contractor’s safety program to the Construction Manager for review and coordination with the safety programs of other Contractors. The Construction Manager’s responsibilities for review and coordination of safety programs shall not extend to direct control over or charge of the acts or omissions of the Contractors, Subcontractors, agents or employees of the Contractors or Subcontractors, or any other persons performing portions of the Work and not directly employed by the Construction Manager.

§ 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;
.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; and
.4 construction or operations by the Owner or other Contractors.

§ 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, 10.2.1.3 and 10.2.1.4 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, 10.2.1.3 and 10.2.1.4, except damage or loss attributable to acts or omissions of the Owner, Construction Manager or Architect or anyone directly or indirectly employed by any of them, or by anyone for whose acts any 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, Construction Manager 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 it is 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, Construction Manager 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 a 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, Construction Manager 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, the Construction Manager and the Architect will promptly reply to the Owner in writing stating whether or not any of them has reasonable objection to the persons or entities proposed by the Owner. If the Contractor, Construction Manager or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor, the Construction Manager and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resumed 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, Construction Manager, Architect, their 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.

§ 10.4 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 there is, 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 which 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; and
.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 submitted to the Construction Manager for transmittal to the Owner with a copy to the Architect 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 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 Construction Manager, the Construction Manager's consultants, 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, fire, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for the Architect’s, Contractor’s, and Construction Manager’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, Construction Manager, 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, adjoining 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 Construction Manager, 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 the Owner and Contractor may have to the proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Construction Manager, Construction Manager’s consultants, Architect, Architect’s consultants, Owner’s 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 mortgage 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 distribution of insurance proceeds in accordance with the direction 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 Construction Manager’s or Architect’s request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by either, be uncovered for their observation 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 which the Construction Manager or Architect has not specifically requested to observe prior to its being covered, the Construction Manager or 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 one of the other Contractors 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 Construction Manager or 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 Construction Manager’s and 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 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 or other Multiple Prime 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, Construction Manager, 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 thereunder, 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 Construction Manager and Architect timely notice of when and where tests and inspections are to be made so that the Construction Manager and 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 Construction Manager, 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 Construction Manager and 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 Construction Manager and Architect of when and where tests and inspections are to be made so that the Construction Manager and 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 Construction Manager’s and 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 Construction Manager for transmittal to the Architect.
§ 13.5.5 If the Construction Manager or Architect is to observe tests, inspections or approvals required by the Contract Documents, the Construction Manager or 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 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 the 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 the 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 Construction Manager has not certified or 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, 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, Construction Manager 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, Construction Manager and 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, after consultation with the Construction Manager, and 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 Construction Manager's and 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, upon application, be certified by the Initial Decision Maker after consultation with the Construction Manager; 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 the 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 this 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 Construction Manager and Architect, if the Construction Manager and or 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 9.5 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 Construction Manager will prepare Change Orders and the Architect will issue a Certificate for Payment or Project Certificate 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 10.3.

§ 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 and Construction Manager, if the Architect or Construction Manager 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.
PART 1 GENERAL

1.01 PROJECT
   A. Project Name: 1806 ITD Brine Facility - Shoshone, Idaho
   B. Architect's Name: Jensen Hayes Shropshire, Architects, P.A. (JHS)

1.02 CONTRACT DESCRIPTION
   A. Contract Type: A single prime contract based on a Stipulated Price.
   B. The work consists of a single building structure of 1600 SF for a brine making facility, salt storage and a brine storage/containment area of 1800 SF as shown on the drawings. The salt storage area (approx. 1/2 of the building) has 10 ft high concrete walls and a wood framed wall and roof system. The brine making area has 2-ft high concrete walls and a wood framed wall and roof system. The building exterior has metal panel siding and roofing.

1.03 WORK BY OWNER
   A. Items noted NIC (Not in Contract) will be supplied and installed by ITD before Substantial Completion.

1.04 CONTRACTOR USE OF SITE AND PREMISES
   A. Construction Operations: Limited to construction activities and storage of materials to be used during the construction period.
      1. Contractor shall take appropriate precautions to protect existing portions of the site outside of the construction area indicated on the drawings.
   B. Provide access to and from site as required by law and by ITD.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION
SECTION 01 2000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Procedures for preparation and submittal of applications for progress payments.

1.02 SCHEDULE OF VALUES
A. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to JHS Architects for approval.
B. Forms filled out by hand will not be accepted.
C. Submit a printed schedule on AIA Form G703 - Application and Certificate for Payment Continuation Sheet. Contractor’s standard form or electronic media printout will be considered.

1.03 APPLICATIONS FOR PROGRESS PAYMENTS
A. Payment Period: Submit at intervals stipulated in the Agreement.
B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to JHS Architects for approval.
C. Forms filled out by hand will not be accepted.
D. Present required information in typewritten form.
E. Form: AIA G702 Application and Certificate for Payment and AIA G703 - Continuation Sheet including continuation sheets when required.
F. Execute certification by signature of authorized officer.
G. Submit one electronic and one hard-copy of each Application for Payment.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION
SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. General administrative requirements.
B. Preconstruction meeting.
C. Progress meetings.
D. Construction progress schedule.
E. Submittals for review, information, and project closeout.
F. Number of copies of submittals.
G. Submittal procedures.

1.02 GENERAL ADMINISTRATIVE REQUIREMENTS
A. Conform to requirements of Section 01 7000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

1.03 PROJECT COORDINATOR
A. Project Architect: Keeven Shropshire, JHS Architects.
B. ITD Representative: Shawn Webb.
C. Cooperate with the Architect and ITD Representative in allocation of mobilization areas of site; for field offices and sheds, for Contractor access, traffic, and parking facilities.
D. During construction, coordinate use of site and facilities through ITD.
E. Comply with Architect's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
F. Comply with instructions of ITD for use of temporary utilities and construction facilities.
G. Coordinate field engineering and layout work under instructions of the Project Architect.
H. Make the following types of submittals to the JHS Architects:
   1. Requests for Interpretation.
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Manufacturer's instructions and field reports.
   6. Applications for payment and change order requests.
   7. Progress schedules.
   8. Coordination drawings.

PART 2 PRODUCTS - NOT USED
PART 3  EXECUTION

3.01 PRECONSTRUCTION MEETING
A. ITD will schedule a meeting prior to Notice to Proceed.
B. Project Coordinator will schedule a meeting after Notice of Award.
C. Attendance Required:
   1. ITD
   2. JHS Architects.
   3. Contractor.
   4. Sub-Contractors.
D. Agenda:
   1. Execution of ITD-Contractor Agreement.
   2. Submission of executed bonds and insurance certificates.
   4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
   5. Designation of personnel representing the parties to Contract, ITD and JHS Architects.
   6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
   7. Use of premises by ITD and Contractor.
   8. ITD Requirements.
   9. Construction facilities and controls provided by ITD.
   10. Temporary utilities provided by ITD.
   12. Schedules.
   14. Procedures for testing.
   15. Procedures for maintaining record documents.
   16. Requirements for start-up of equipment.
   17. Inspection and acceptance of equipment put into service during construction period.
E. JHS will record minutes and distribute copies within two days after meeting to participants, with one copy to JHS Architects, ITD, and Contractor.

3.02 PROGRESS MEETINGS
A. JHS Architects will schedule and administer meetings throughout progress of the Work at maximum monthly intervals.
B. JHS will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
C. Project Coordinator will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
D. Attendance Required: Job superintendent, major Subcontractors and suppliers, ITD, JHS Architects, as appropriate to agenda topics for each meeting.
E. Agenda:
   1. Review minutes of previous meetings.
   2. Review of work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems that impede, or will impede, planned progress.
   5. Review of submittals schedule and status of submittals.
   6. Review of off-site fabrication and delivery schedules.
   7. Maintenance of progress schedule.
   8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on progress schedule and coordination.
13. Other business relating to work.

F. JHS will record minutes and distribute copies within two days after meeting to participants, with one copy to ITD, JHS Architects, and Contractor.

3.03 CONSTRUCTION PROGRESS SCHEDULE
A. Within 10 days after date established in Notice to Proceed, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.
B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
C. See Supplementary Conditions Section 3.10 for requirements of CPM Schedule.
D. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
   1. Include written certification that major contractors have reviewed and accepted proposed schedule.
E. Within 10 days after joint review, submit complete schedule.
F. Submit updated schedule with each Application for Payment.

3.04 SUBMITTALS FOR REVIEW
A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.
B. Submit to JHS Architects for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
C. Allow work days for initial review.
D. Samples will be reviewed for aesthetic, color, or finish selection.

3.05 SUBMITTALS FOR INFORMATION
A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.
   5. Manufacturer's instructions.
   6. Manufacturer's field reports.
   7. Other types indicated.
B. Submit for JHS Architects knowledge as contract administrator. No action will be taken.

3.06 SUBMITTALS FOR PROJECT CLOSEOUT
A. Submit Final Correction Punch List for Substantial Completion.
B. When the following are specified in individual sections, submit them at project closeout in conformance to requirements of Section 01 7800 - Closeout Submittals:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   5. Other types as indicated.
3.07 NUMBER OF COPIES OF SUBMITTALS
   A. Documents for Review:
      1. Submit electronic PDF files by email to JHS Architects.
   B. Documents for Information: Submit PDF files by email to JHS Architects.
   C. Documents for Project Closeout: Make three reproduction of submittal originally reviewed. Submit one extra of submittals for information.
   D. Samples: Submit the number specified in individual specification sections; one of which will be retained by JHS Architects.
      1. Retained samples will not be returned to Contractor unless specifically so stated.

3.08 SUBMITTAL PROCEDURES
   A. Shop Drawing Procedures:
      1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related Work.
      2. Generic, non-project specific information submitted as shop drawings do not meet the requirements for shop drawings.
   B. Transmit each submittal with a copy of approved submittal form.
   C. Transmit each submittal with approved form.
   D. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
   E. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
   F. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
   G. Email submittals to Keeven Shropshire: keeven@jhsarchitects.com with copy to Emily Smith: emily@jhsarchitects.com.
   H. Schedule submittals to expedite the Project, and coordinate submission of related items.
   I. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.
   J. Provide space for Contractor and JHS Architects review stamps on hardcopy submittals.
   K. When revised for resubmission, identify all changes made since previous submission.
   L. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
   M. Submittals not requested will not be recognized or processed.
SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Submittals.
   B. References and standards.
   C. Control of installation.
   D. Tolerances.
   E. Testing and inspection agencies and services.
   F. Control of installation.
   G. Tolerances.
   H. Manufacturers' field services.
   I. Defect Assessment.

1.02 RELATED REQUIREMENTS
   A. Section 01 4219 - Reference Standards.

1.03 SUBMITTALS
   A. See Section 01 3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
   B. Testing Agency Qualifications:
      1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
      2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
   C. Design Data: Submit for JHS Architects's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for ITD's information.
   D. Test Reports: After each test/inspection, promptly submit two copies of report to JHS Architects and to Contractor.
      1. Include:
         a. Date issued.
         b. Project title and number.
         c. Name of inspector.
         d. Date and time of sampling or inspection.
         e. Identification of product and specifications section.
         f. Location in the Project.
         g. Type of test/inspection.
         h. Date of test/inspection.
         i. Results of test/inspection.
         j. Conformance with Contract Documents.
         k. When requested by JHS Architects, provide interpretation of results.
E. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to JHS Architects, in quantities specified for Product Data.
   1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   2. Certificates may be recent or previous test results on material or product, but must be acceptable to JHS Architects.

F. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing. ITD indicates special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

G. Manufacturer's Field Reports: Submit reports for JHS Architects benefit as contract administrator.
   1. Submit report in duplicate within 30 days of observation to JHS Architects for information.
   2. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

H. Manufacturer's Field Reports: Submit reports for JHS Architects's benefit as contract administrator or for ITD.
   1. Submit report in duplicate within 30 days of observation to JHS Architects for information.
   2. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

I. Erection Drawings: Submit drawings for JHS Architects's benefit as contract administrator or for ITD.
   1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
   2. Data indicating inappropriate or unacceptable Work may be subject to action by JHS Architects or ITD.

1.04 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from JHS Architects before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of JHS Architects shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.05 TESTING AND INSPECTION AGENCIES AND SERVICES

A. ITD will employ services of an independent testing agency to perform certain specified testing; payment for cost of services will be derived from allowance specified in Section 01210; see Section 01210 and applicable sections for description of services included in allowance.

B. ITD will employ and pay for services of an independent testing agency to perform other specified testing.

C. Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.
D. As indicated in individual specification sections, ITD or Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.

E. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION
   A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
   B. Comply with manufacturers' instructions, including each step in sequence.
   C. Should manufacturers' instructions conflict with Contract Documents, request clarification from JHS Architects before proceeding.
   D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
   E. Have Work performed by persons qualified to produce required and specified quality.
   F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
   G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 TOLERANCES
   A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
   B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from JHS Architects before proceeding.
   C. Adjust products to appropriate dimensions; position before securing products in place.

3.03 TESTING AND INSPECTION
   A. Testing Agency Duties:
      1. Provide qualified personnel at site. Cooperate with JHS Architects and Contractor in performance of services.
      2. Perform specified sampling and testing of products in accordance with specified standards.
      3. Ascertian compliance of materials and mixes with requirements of Contract Documents.
      4. Promptly notify JHS Architects and Contractor of observed irregularities or non-conformance of Work or products.
      5. Perform additional tests and inspections required by JHS Architects.
      6. Submit reports of all tests/inspections specified.
   B. Limits on Testing/Inspection Agency Authority:
      1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
      2. Agency may not approve or accept any portion of the Work.
      3. Agency may not assume any duties of Contractor.
      4. Agency has no authority to stop the Work.
C. Contractor Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers’ facilities.
3. Provide incidental labor and facilities:
   a. To provide access to Work to be tested/inspected.
   b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
   c. To facilitate tests/inspections.
   d. To provide storage and curing of test samples.
4. Notify JHS Architects and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
6. Arrange with the Testing Agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

D. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by JHS Architects.
E. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.
F. Owner's Responsibilities: 1. Provide Payment for services of independent testing agency to provide testing as specified or as directed by JHS Architects.

3.04 MANUFACTURERS' FIELD SERVICES
A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.
B. Report observations and site decisions or instructions given to applicators or installers that are supplemenal or contrary to manufacturers' written instructions.

3.05 DEFECT ASSESSMENT
A. Replace Work or portions of the Work not conforming to specified requirements.
B. If, in the opinion of the Architect, it is not practical to remove and replace the Work, the Architect will direct an appropriate remedy or adjust payment.

END OF SECTION
SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1  GENERAL

1.01  SECTION INCLUDES
   A.  Temporary telecommunications services.
   B.  Temporary sanitary facilities.
   C.  Temporary Controls:  Barriers, enclosures, and fencing.
   D.  Security requirements.
   E.  Vehicular access and parking.
   F.  Waste removal facilities and services.

1.02  TEMPORARY UTILITIES
   A.  Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.
   B.  Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.03  TELECOMMUNICATIONS SERVICES
   A.  Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
   B.  Telecommunications services shall include:
       1.  Telephone and electronic data services.

1.04  TEMPORARY SANITARY FACILITIES
   A.  Provide and maintain required facilities and enclosures.  Provide at time of project mobilization.
       1.  Provide a portable toilet unit within 180 feet of building which is under construction.
   B.  Maintain daily in clean and sanitary condition.

1.05  BARRIERS
   A.  Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
   B.  Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06  FENCING
   A.  Construction:  Contractor's option.
       1.  Provision of fencing is entirely the contractors decision as Contractor deems appropriate to protect his/her interests.
       2.  If fencing of the site is opted, Contractor shall provide chain link, plastic mesh, hog wire (6x6 mesh wire), or other approved material.

1.07  SECURITY
   A.  Provide level of security deemed necessary to protect the interests of the Contractor at the option of the contractor.
   B.  Take measures to protect the Work from unauthorized entry, vandalism, or theft.
   C.  Coordinate with ITD's security program.
1.08 VEHICULAR ACCESS AND PARKING
   A. Coordinate access and haul routes with governing authorities and ITD.
   B. Provide means of removing mud from vehicle wheels before entering streets.
   C. Provide temporary parking areas to accommodate construction personnel and coordinate parking with ITD.

1.09 WASTE REMOVAL
   A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
   B. Provide containers with lids. Remove trash from site periodically.
   C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

1.10 FIELD OFFICES
   A. Contractor Option: Provide separate private office similarly equipped and furnished, for use of JHS Architects and ITD.

1.11 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS
   A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
   B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
   C. Clean and repair damage caused by installation or use of temporary work.
   D. Restore existing facilities used during construction to original condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION
SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1  GENERAL

1.01  SECTION INCLUDES
A. General product requirements.
B. Transportation, handling, storage and protection.
C. Product option requirements.
D. Substitution limitations.
E. Procedures for ITD-supplied products.
F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02  RELATED REQUIREMENTS
A. Section 01 1000 - SUMMARY.
B. Section 01 4000 - Quality Requirements: Product quality monitoring.

1.03  SUBMITTALS
A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2  PRODUCTS

2.01  NEW PRODUCTS
A. Provide new products unless specifically required or permitted by the Contract Documents.

2.02  PRODUCT OPTIONS
A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed unless pre-bid approved as an EQUAL.
C. Products Specified by Naming One or More Manufacturers with a Provision for "OR EQUAL": Use any Product or Manufacturer which is fully equal to that specified and comply with all submittal requirements.

2.03  MAINTENANCE MATERIALS
A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. See Section 01 2500 - Substitution Procedures.

B. Instructions to Bidders specify time restrictions for submitting requests for substitutions (requests for equals) during the bidding period. Comply with requirements specified in this section.

C. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by the Contractor after award of the Contract are considered requests for "substitutions". The following are not considered substitutions:

1. Substitutions requested during the bidding period, and accepted prior to award of contract are referred to as "requests for approval as Equals".
2. Revisions to Contract Documents requested by the Owner or Architect.
4. Compliance with governing regulations and orders issued by governing authorities.

D. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.

E. A Contractors substitution request will be received and considered by JHS when one or more of the following conditions are satisfied, as determined by JHS; otherwise requests will be returned without action except to record noncompliance with these requirements.

1. Extensive revisions to Contract documents are not required.
2. Proposed charges are in keeping with the general intent of contract documents.
3. The request is not directly related to an "or equal" clause in the Contract Documents.
4. The request is timely, fully documented and properly submitted.
5. The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
6. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
7. A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner or separate contractors, and similar considerations.
8. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the proposed substitution will overcome the incompatibility.
9. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution will overcome the incompatibility.
10. The specified product or method of construction cannot provide a warranty required by the contract documents, and where the Contractor certifies that the proposed substitution will provide the required warranty.

F. A request for substitution constitutes a representation that the submittor:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
2. Agrees to provide the same warranty for the substitution as for the specified product.
3. Agrees to coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to ITD.
4. Waives claims for additional costs or time extension that may subsequently become apparent.

G. Substitution Submittal Procedure (after contract award):
   1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
   2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
   3. JHS Architects will notify Contractor in writing of decision to accept or reject request.

3.02 TRANSPORTATION AND HANDLING
   A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
   B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
   C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
   D. Transport and handle products in accordance with manufacturer's instructions.
   E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
   F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
   G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
   H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION
   A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
   B. Store and protect products in accordance with manufacturers' instructions.
   C. Store with seals and labels intact and legible.
   D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
   E. For exterior storage of fabricated products, place on sloped supports above ground.
   F. Provide off-site storage and protection when site does not permit on-site storage or protection.
   G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
   H. Comply with manufacturer's warranty conditions, if any.
   I. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
   J. Prevent contact with material that may cause corrosion, discoloration, or staining.
   K. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
   L. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION
SECTION 01 7000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Examination, preparation, and general installation procedures.
B. Pre-installation meetings.
C. Surveying for laying out the work.
D. Cleaning and protection.
E. Demonstration and instruction of ITD personnel.
F. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

1.02 RELATED REQUIREMENTS
A. Section 01 1000 - SUMMARY: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
B. Section 01 3000 - ADMINISTRATIVE REQUIREMENTS: Submittals procedures, Electronic document submittal service.
C. Section 01 4000 - Quality Requirements: Testing and inspection procedures.
D. Section 01 5000 - Temporary Facilities and Controls: Temporary interior partitions.

1.03 SUBMITTALS
A. See Section 01 3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

1.04 QUALIFICATIONS
A. For survey work employ a land surveyor registered in the State in which the Project is located and acceptable to JHS Architects.

1.05 PROJECT CONDITIONS
A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
B. Protect site from puddling or running water. Do not allow water to pool around foundations, footings, or within building area. Provide water barriers as required to protect site from soil erosion.
C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
D. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
E. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
   1. Minimize amount of bare soil exposed at one time.
   2. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

1.06 COORDINATION
   A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
   B. Notify affected utility companies and comply with their requirements.
   C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
   D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
   E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
   F. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion.
   G. After ITD occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of ITD's activities.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that existing site conditions are acceptable for work. Start of work means acceptance of existing conditions.
   B. Examine and verify specific conditions described in individual specification sections.
   C. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
   D. Verify that utility services are available, of the correct characteristics, and in the correct locations.

3.02 PREPARATION
   A. Clean substrate surfaces prior to applying next material or substance.
   B. Seal cracks or openings of substrate prior to applying next material or substance.
   C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS
   A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
   B. Require attendance of parties directly affecting, or affected by, work of the specific section.
   C. Notify JHS Architects four days in advance of meeting date.
D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to JHS Architects, DPW Inspector, ITD, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify JHS Architects of any discrepancies discovered.

C. Contractor shall locate and protect survey control and reference points.

D. Control datum for survey is that indicated on drawings.

E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

F. Promptly report to JHS Architects the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to JHS Architects.

H. Utilize recognized engineering survey practices.

I. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

J. Periodically verify layouts by same means.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to JHS Architects before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

3.07 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
5. Repair areas adjacent to cuts to required condition.
6. Repair new work damaged by subsequent work.
7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-conforming work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing.
E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
F. Restore work with new products in accordance with requirements of Contract Documents.
G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
H. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.08 PROGRESS CLEANING
A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
B. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
C. Collect and remove waste materials, debris, and trash/rubbish from site weekly and dispose off-site; do not burn or bury.

3.09 PROTECTION OF INSTALLED WORK
A. Protect installed work from damage by construction operations.
B. Provide special protection where specified in individual specification sections.
C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
G. Prohibit traffic from landscaped areas.
H. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.10 DEMONSTRATION AND INSTRUCTION
A. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
B. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of owner personnel.

3.11 ADJUSTING
A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.12 FINAL CLEANING
A. Use cleaning materials that are nonhazardous.
B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

E. Clean filters of operating equipment.

F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.

G. Clean site.

H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.

B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify JHS Architects when work is considered ready for JHS Architects's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for JHS Architects's Substantial Completion inspection.

E. Conduct Substantial Completion inspection and create Final Correction Punch List containing JHS Architects's and Contractor's comprehensive list of items identified to be completed or corrected and submit to JHS Architects.

F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to ITD-occupied areas.

G. Notify JHS Architects when work is considered finally complete and ready for JHS Architects's Substantial Completion final inspection.

H. Complete items of work determined by JHS Architects listed in executed Certificate of Substantial Completion.

END OF SECTION
SECTION 03 3000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Concrete formwork.
B. Concrete footings.
C. Concrete foundation walls and footing.
D. Floors and slabs on grade.
E. Concrete reinforcement.
F. Joint devices associated with concrete work.
G. WaterStop at Slab to walls on Brine Containments.
H. Accessories items in or under concrete elements.
I. Concrete curing.

1.02 RELATED REQUIREMENTS
A. Section 07 9200 - Joint Sealants: Products and installation for sealants at saw cut joints and isolation joints in slabs.
B. Section 07 9005 - Joint Sealers: Sealants for saw cut joints and isolation joints in slabs.

1.03 REFERENCE STANDARDS
B. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).
C. ACI 302.1R - Guide for Concrete Floor and Slab Construction; 2004 (Errata 2007).
E. ACI 305R - Hot Weather Concreting; 2010.
F. ACI 306R - Cold Weather Concreting; 2010.
G. ACI 308R - Guide to Curing Concrete; 2001 (Reapproved 2008).
H. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2011.
R. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a (Reapproved 2013).
S. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2011.

1.04 SUBMITTALS
A. See Section 01 3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Product Data: Submit manufacturers’ data on manufactured products showing compliance with specified requirements and installation instructions.
C. Design Mixes for review and approval.
D. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
E. Samples: Submit samples of underslab vapor retarder to be used.
F. Sustainable Design Submittal: If any fly ash, ground granulated blast furnace slag, silica fume, rice hull ash, or other waste material is used in mix designs to replace Portland cement, submit the total volume of concrete cast in place, mix design(s) used showing the quantity of portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used.
G. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.05 QUALITY ASSURANCE
A. Perform work of this section in accordance with ACI 301 and ACI 318.
   1. Maintain one copy of each document on site.
B. Follow recommendations of ACI 305R when concreting during hot weather.
C. Follow recommendations of ACI 306R when concreting during cold weather.

PART 2 PRODUCTS

2.01 FORMWORK
A. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
   1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
   2. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
   3. Form Ties: Manufacturers standard snap wire ties.

2.02 REINFORCEMENT
A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Type: Deformed billet-steel bars.
   2. Finish: Unfinished, unless otherwise indicated.
B. Reinforcement Accessories:  
1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.  
2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.  
3. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.

2.03 CONCRETE MATERIALS  
A. Cement: ASTM C150/C150M, Type I - Normal Portland type.  
   1. Acquire cement for entire project from same source.  
   1. Acquire aggregates for entire project from same source.  
C. Fly Ash: ASTM C618, Class C or F.  
D. Calcined Pozzolan: ASTM C618, Class N.  
E. Water: Clean and not detrimental to concrete.

2.04 ADMIXTURES  
A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.  
B. Air Entrainment Admixture: ASTM C260/C260M.  
C. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.

2.05 ACCESSORY MATERIALS  
A. Vapor Retardier below slab: 8 mil visqueen sheet over prepared base at Brine Containments.  
B. Slab edge expansion joints: Polyfoam # PF-H50, 6 inch x 1/2” with a pre-scored, removable top piece for slab to wall sealant application. Product by Superior Profiles or equal.  
C. Cold or Construction Joints: Keyway # 21-KW-10, re-usable polyethylene keyway strip. Product by Superior Profiles or equal.  
D. Control Joints: Expansion- and Isolation-Joint-Filler Strips- Zipstrip # 21-1 1/2 x 10, rigid polystyrene "T" shaped strip for forming straight control joints from wall to wall. Construct isolation joints in slabs-on-grade at points of contact between slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations as indicated. After initial set, remove horizontal portion of the "T" and tool edges for sealant application. Product by Superior Profiles or equal.  
E. Backer Rod: Closed Cell Backer Rod to for a non-absorbent compressible backup for sealant joint backup. Sizes 1/4” to 4” as required. Product by Superior Profiles or equal.  
F. Bonding Agent: ASTM C I 059, Type II, non-redispersable, acrylic emulsion or styrene butadiene.  
G. Insulated Underslab Vapor Retarder: Multi-layer product of high density closed-cell foam and high density polyethylene bubble sandwiched between outer layers of aluminum-reinforced polyethylene or equivalent, stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs where radiant floor heat system is utilized. The use of single ply polyethylene is prohibited.  
   1. Installation: Comply with ASTM E1643.  
   2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.  
   3. Manufacturers:  
H. Underslab Waterproofing and Vapor Retarder: Semi-rigid bituminous membrane, seven-ply, complying with ASTM E1993/E1993M.  
   1. Composition: Weather-resistant coated, permanently bonded bituminous core board composed of an inner core, suspended and sealed within high melt point asphalt-impregnated felt, with glass mat liner and polyethylene anti-stick sheet.
2. Permeance: 0.002 perms, maximum.
3. Tensile Strength: 140 pounds-force/inch, minimum.
4. Puncture Resistance: 90 pounds-force, minimum, when tested in accordance with ASTM E154/E154M.
5. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.

I. Waterstop: Integral rubber waterstop strip cast into concrete cold joint between floor slab and curb wall at Brine Containments.
   1. Manufacturers:
      a. Sika
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.06 REPAIR MATERIALS
A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
   1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 2 19.
   2. Primer: Product of underlayment manuf. recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand per manufacturer.
   4. Compressive Strength: Not less than 4 1 00 psi at 28 days when tested according to ASTM C 109/C 109M.

2.07 BONDING AND JOINTING PRODUCTS
A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.
   1. Manufacturers:
   B. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
   C. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with rectangular or round knockout holes for conduit or rebar to pass through joint form at 6 inches on center; ribbed steel stakes for setting.

2.08 CURING MATERIALS
A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.
   1. Manufacturers:
      a. Dayton Superior Corporation; AquaFilm Concentrate J74: www.daytonsuperior.com/#sle.
      b. Euclid Chemical Company; EUCOBAR: www.euclidchemical.com/#sle.
      c. Kaufman Products Inc; VaporAid: www.kaufmanproducts.net/#sle.
      d. SpecChem, LLC; SpecFilm Concentrate or SpecFilm RTU: www.specchemllc.com/#sle.
      e. W. R. Meadows, Inc; Evapre or Evapre-RTU: www.wrmeadows.com/#sle.
      f. Substitutions: See Section 01 6000 - Product Requirements.

2.09 CONCRETE MIX DESIGN
A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
   1. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with ACI recommendations.

   B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
1. For trial mixtures method, employ independent testing agency acceptable to JHS Architects for preparing and reporting proposed mix designs.

C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

D. Normal Weight Concrete:
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 3,000 pounds per square inch at Footings & Slabs; 4000 pounds per square inch at Walls and Exterior flatwork.
   2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
   3. Calcinied Pozzolan Content: Maximum 10 percent of cementitious materials by weight.
   4. Cement Content: Minimum 504 lb per cubic yard.
   5. Water-Cement Ratio: Maximum 45 percent by weight.
   6. Total Air Content: 3 percent, determined in accordance with ASTM C173/C173M.

2.10 MIXING
   A. Transit Mixers: Comply with ASTM C94/C94M.

2.11 CONCRETE CURING
   A. Curing compounds or agents are not permitted where epoxy coatings or crystalline waterproofing is applied at Brine Containments and Brine making areas.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION
   A. Verify that forms are clean and free of rust before applying release agent.
   B. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
   C. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in accordance to bonding agent manufacturer's instructions.
      1. Use latex bonding agent only for non-load-bearing applications.
   D. Where new concrete with integral waterproofing is to be bonded to previously placed concrete, prepare surfaces to be treated in accordance with waterproofing manufacturer's instructions. Saturate cold joint surface with clean water, and remove excess water before application of coat of waterproofing admixture slurry. Apply slurry coat uniformly with semi-stiff bristle brush at rate recommended by waterproofing manufacturer.
   E. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.
   F. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS
   A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.
   B. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.
3.04 PLACING CONCRETE
A. Place concrete in accordance with ACI 304R.
B. Place concrete for floor slabs in accordance with ACI 302.1R.
C. Install under slab Vapor Barrier below all floors on grade.
D. Notify JHS Architects not less than 24 hours prior to commencement of placement operations.
E. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
F. Ensure reinforcement, inserts, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
G. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.
H. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.05 SLAB JOINTING
A. Locate joints as indicated on drawings.
B. Anchor joint fillers and devices to prevent movement during concrete placement.
C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
D. Construction Joints: Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant.

3.06 FLOOR FLATNESS AND LEVELNESS TOLERANCES
A. Maximum Variation of Surface Flatness:
   1. Exposed Concrete Floors: 1/4 inch in 10 feet.
B. Correct the slab surface if tolerances are less than specified.
C. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.07 CONCRETE FINISHING
A. Repair surface defects, including tie holes, immediately after removing formwork.
B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
   1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.

3.08 CURING AND PROTECTION
A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
   1. Normal concrete: Not less than 7 days.
C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.
D. Surfaces Not in Contact with Forms:
   1. Initial Curing of Floor Slabs: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
      a. Ponding: Maintain 100 percent coverage of water over floor slab areas, continuously for 4 days.
      b. Spraying: Spray water over floor slab areas and maintain wet.
      c. Saturated Burlap: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place.
   2. Final Curing: Begin after initial curing but before surface is dry.
      a. Moisture-Retaining Sheet: Lap strips not less than 3 inches and seal with waterproof tape or adhesive; secure at edges.

3.09 FIELD QUALITY CONTROL
A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.
B. Provide free access to concrete operations at project site and cooperate with appointed firm.
C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
D. Compressive Strength Tests: ASTM C39/C39M. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.
E. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

3.10 DEFECTIVE CONCRETE
A. Test Results: The testing agency shall report test results in writing to JHS Architects and Contractor within 24 hours of test.
B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
C. Repair or replacement of defective concrete will be determined by the JHS Architects. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of JHS Architects for each individual area.

3.11 PROTECTION
A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION
SECTION 05 5000
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Pipe Bollards.
   B. Jamb and head frame at O.H. Sectional doors.
   C. Salt Hopper.

1.02 RELATED REQUIREMENTS
   A. Section 03 3000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.
   B. Section 09 9113 - Exterior Painting: Paint finish.
   C. Section 23 0000 - Brine Maker, Integrated Controls.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS
   A. See Section 01 3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
   B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1.05 QUALITY ASSURANCE
   A. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL
   A. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
   B. Plates: ASTM A283/A283M.
   C. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
   D. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.
   E. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
   F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
2.02 FABRICATION
A. Fit and shop assemble items in largest practical sections, for delivery to site.
B. Fabricate items with joints tightly fitted and secured.
C. Continuously seal joined members by intermittent welds and plastic filler.
D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS
A. Salt Hopper: Manufacturer designed hoppers unit for five (5) cubic yard capacity. Submit design engineering and shop drawings for review by Architect.
   1. Sloped top grating with members spaced 4-inches on-center each way.
   2. Clean out access doors, both sides.
   3. Side wall supports per manufacturers design with legs and feet to bolt down to concrete housekeeping pad.
   4. Hopper outlet at bottom design to allow installation of 8-inch diameter auger.

2.04 FINISHES - STEEL
A. Prime paint steel items.
   1. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
B. Prepare surfaces to be primed in accordance with SSPC-SP2.
C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
D. Paint priming: One coat.

2.05 FABRICATION TOLERANCES
A. Squareness: 1/8 inch maximum difference in diagonal measurements.
B. Maximum Offset Between Faces: 1/16 inch.
C. Maximum Misalignment of Adjacent Members: 1/16 inch.
D. Maximum Bow: 1/8 inch in 48 inches.
E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION
A. Clean and strip primed steel items to bare metal where site welding is required.

3.03 INSTALLATION
A. Install items plumb and level, accurately fitted, free from distortion or defects.
B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
C. Obtain approval prior to site cutting or making adjustments not scheduled.
D. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.
3.04 TOLERANCES
   A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
   B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION
SECTION 06 1000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Exterior lumber framing.
B. Rough opening framing for doors, windows, and roof openings.
C. Wall Sheathing.
D. Roof Sheathing.
E. Roofing nailers.
F. Structural Specifications: Reference both Sections included herein and Structural Drawings.

1.02 RELATED REQUIREMENTS
A. Section 03 3000 - Cast-in-Place Concrete: Setting anchors in concrete.
B. Section 07 2100 - Thermal Insulation: Fiberglass Batts.
C. Section 07 2500 - Weather Barriers: Air barrier over sheathing.
D. Section 07 6200 - Sheet Metal Flashing and Trim: Sill flashings.

1.03 REFERENCE STANDARDS
C. AFPA (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; American Forest and Paper Association; 2012.
F. PS 1 - Structural Plywood; 2009.
G. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.
I. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17; 2004, and supplements.
J. WWPA G-5 - Western Lumber Grading Rules; 2011.

1.04 SUBMITTALS
A. See Section 01 3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Product Data: Provide technical data on wood preservative materials and application instructions.
C. Structural Composite Lumber: Submit manufacturer's published structural data including span tables, marked to indicate which sizes and grades are being used; if structural composite lumber is being substituted for dimension lumber or timbers, submit grading agency structural tables marked for comparison.
D. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.
1.05 QUALITY ASSURANCE
A. Lumber: Comply with PS 20 and approved grading rules and inspection agencies.
   1. Acceptable Lumber Inspection Agencies: Any agency with rules approved by American
      Lumber Standards Committee.
   2. Lumber of other species or grades, or graded by other agencies, is acceptable provided
      structural and appearance characteristics are equivalent to or better than products
      specified.

1.06 DELIVERY, STORAGE, AND HANDLING
A. General: Cover wood products to protect against moisture. Support stacked products to prevent
   deformation and to allow air circulation.

1.07 WARRANTY
A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS
A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. If no species is specified, provide any species graded by the agency specified; if no
      grading agency is specified, provide lumber graded by any grading agency meeting the
      specified requirements.
   2. Grading Agency: Any grading agency whose rules are approved by the Board of Review,
      American Lumber Standard Committee (www.alsc.org) and who provides grading service
      for the species and grade specified; provide lumber stamped with grade mark unless
      otherwise indicated.

2.02 DIMENSION LUMBER
A. Grading Agency: Western Wood Products Association; WWPA G-5.
B. Sizes: Nominal sizes as indicated on drawings, S4S.
C. Moisture Content: S-dry or MC19.
D. Stud Framing (2 by 2 through 2 by 6): 2 x 6 studs
   2. Grade: No. 2.
E. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3 or stud.
F. Miscellaneous Blocking, Furring, and Nailers:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3 or stud.

2.03 STRUCTURAL COMPOSITE LUMBER
A. At Contractor's option, structural composite lumber may be substituted for concealed dimension
   lumber and timbers.
B. Structural Composite Lumber: Factory fabricated beams, headers, and columns, of sizes and
   types indicated on drawings; structural capacity as published by manufacturer.
   1. Columns: Use laminated veneer lumber, laminated strand lumber, or parallel strand
      lumber with manufacturer's published E (modulus of elasticity): 1,800,000 psi, minimum.
   2. Beams: Use laminated veneer lumber, laminated strand lumber, or parallel strand lumber
      with manufacturer's published E (modulus of elasticity): 1,800,000 psi, minimum.
4. Manufacturers:
   d. Substitutions: See Section 01 6000 - Product Requirements.

2.04 CONSTRUCTION PANELS

A. Roof Sheathing: APA PRP-108, Structural I Rated Sheathing, Exterior Exposure Class, and as follows:
   1. Structural I.
   2. Thickness: 19/32" (5/8").
   5. Exposure Time: Sheathing undamaged after exposure to weather for up to 180 days.
   6. Provide fastening guide on top panel surface with separate markings indicating fastner spacing for 16 inches and 24 inches on center, respectively.

B. Interior Wall Sheathing: Any PS 2 type.
   2. Grade: Structural I Sheathing.
   4. Performance Category: 5/16 PERF CAT.
   5. Edge Profile: Tongue and groove.

C. Exterior Wall Sheathing: APA PRP-108, Structural I Rated Sheathing, Exterior Exposure Class, and as follows:
   1. Structural I.
   2. Thickness: 15/32" (1/2").
   4. Thickness: 1/2 inch, nominal.

2.05 ACCESSORIES

A. Fasteners and Anchors:

B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.

C. Seismic Hold Down anchors and Hurricane framing anchors by Simpson or approved equal.

D. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.

E. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.

F. Air & Water-Resistive Barrier: As specified in Section 07 2500.

2.06 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
   1. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
   2. Treat lumber in contact with masonry or concrete.
PART 3 EXECUTION

3.01 PREPARATION
   A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches and seal.
   B. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.
   C. Coordinate installation of rough carpentry members specified in other sections.
   D. Coordinate Wood Window unit sizes prior to framing exterior walls.

3.02 INSTALLATION - GENERAL
   A. Select material sizes to minimize waste.
   B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
   C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 FRAMING INSTALLATION
   A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
   B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
   C. Install structural members full length without splices unless otherwise specifically detailed.
   D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and 1 Wood Frame Construction Manual.
   E. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.
   F. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 BLOCKING, NAILERS, AND SUPPORTS
   A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
   B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.
   C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
   D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
   E. Provide the following specific non-structural framing and blocking:
      1. Wall brackets.
      2. Wall-mounted door stops.
      3. Wall paneling and trim.
      4. Joints of rigid wall coverings that occur between studs.
3.05 ROOF-RELATED CARPENTRY
   A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.
   B. Provide miscellaneous members as indicated or as required to support finishes, fixtures, specialty items, and trim.

3.06 INSTALLATION OF ACCESSORIES AND MISCELLANEOUS WOOD
   A. Place full width continuous sill flashings under framed walls on cementitious foundations. Lap flashing joints 4 inches and seal.
   B. Place sill gasket directly on cementitious foundation. Puncture gasket cleanly and fit tightly to protruding foundation anchor bolts.
   C. Coordinate installation of plywood web joists.

3.07 INSTALLATION OF CONSTRUCTION PANELS
   A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
      1. Provide solid edge blocking between sheets where indicated in structural.
      2. Nail panels to framing; staples are not permitted.
   B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.
      1. Note requirements on structural drawings for sheathing to span continuous sheathing to parapet wall shall extend from the top of wall to well below the bearing plates - See Structural detail.

3.08 TOLERANCES
   A. Framing Members: 1/4 inch from true position, maximum.
   B. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.
   C. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.09 CLEANING
   A. Waste Disposal: Comply with the requirements of Section 01 7419 - Construction Waste Management and Disposal.
      1. Comply with applicable regulations.
      2. Do not burn scrap on project site.
      3. Do not burn scraps that have been pressure treated.
      4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.
   B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
   C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES
A. Shop fabricated wood trusses for roof framing.
B. Bridging, bracing, and anchorage.

1.02 RELATED REQUIREMENTS
A. Section 06 1000 - Rough Carpentry: Installation requirements for miscellaneous framing.
B. Section 06 1000 - Rough Carpentry: Material requirements for blocking, bridging, plates, and miscellaneous framing.

1.03 REFERENCE STANDARDS
A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
H. See General Structural Notes for additional design requirements and design load conditions.

1.04 SUBMITTALS
A. See Section 01 3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Product Data: Manufacturer's data sheets on plate connectors, bearing plates, and metal bracing components.
C. Shop Drawings: Show truss configurations, sizes, spacing, size and type of plate connectors, cambers, framed openings, bearing and anchor details, and bridging and bracing.
   1. Include identification of engineering software used for design.
   2. Provide shop drawings stamped or sealed by design engineer.
   3. Submit design calculations.

1.05 QUALITY ASSURANCE
A. Designer Qualifications: Perform design by or under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in Idaho.
B. Fabricator Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
C. Field Measurements - Verify that field measurements are as indicated in the drawings.
1.06 DELIVERY, STORAGE, AND HANDLING
   A. Handle and erect trusses in accordance with TPI BCSI 1.
   B. Store trusses in vertical position resting on bearing ends.

PART 2 PRODUCTS

3.01 MANUFACTURERS
   A. Truss Plate Connectors:
      4. Substitutions: See Section 01 6000 - Product Requirements.
   B. Truss Fabricators:
      1. Sheppard Truss Company; Blackfoot, Idaho.
      2. BMC West; Idaho Falls, Idaho.
      3. Substitutions: See Section 01 6000 - Product Requirements.

3.02 TRUSSES
   A. Wood Trusses: Designed and fabricated in accordance with TPI 1 and TPI DSB-89 to achieve structural requirements indicated.
      1. Connectors: Steel plate.

3.03 MATERIALS
   A. Lumber Grading Rules: RIS (GR), Grade.
      1. Moisture Content: Between 7 and 9 percent.
   B. Wood Members: Single top and bottom chord, Stress Group as determined by truss manufacturer, 19 percent maximum and 7 percent minimum moisture content. Finger scarfing permitted.
   C. Steel Connectors: Hot-dipped galvanized steel sheet, ASTM A653/A653M Structural Steel (SS) Grade 33/230, with G90/Z275 coating; die stamped with integral teeth; thickness as indicated.
   D. Truss Bridging: Type, size and spacing recommended by truss manufacturer.

3.04 ACCESSORIES
   A. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: Softwood lumber, any species, construction grade, 19 percent maximum and 7 percent minimum moisture content.
   B. Fasteners: Electrogalvanized steel, type to suit application.
   C. Bearing Plates: Electrogalvanized steel.

3.05 FABRICATION
   A. Fabricate trusses to achieve structural requirements specified.
   B. Brace wood trusses in accordance with TPI DSB-89 and BCSI 1.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that field measurements are as indicated.
   B. Verify that supports and openings are ready to receive trusses.

3.02 PREPARATION
   A. Coordinate placement of bearing items.
3.03 ERECTION
A. Install trusses in accordance with manufacturer's instructions and TPI DSB-89 and TPI BCSI 1; maintain a copy of each TPI document on site until installation is complete.
B. Set members level and plumb, in correct position.
C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure plumb, and in true alignment until completion of erection and installation of permanent bracing.
D. Do not field cut or alter structural members without approval of JHS Architects.
E. Install permanent bridging and bracing.
F. Install headers and supports to frame openings required.
G. Frame openings between trusses with lumber in accordance with Section 06 1000.
H. Coordinate placement of decking with work of this section.
I. After erection, touch-up primed surfaces with primer consistent with shop coat.

3.04 TOLERANCES
A. Framing Members: 1/2 inch maximum, from true position.

END OF SECTION
SECTION 06 1800
GLUED-LAM VENEER STRUCTURAL UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Glue laminated veneer lumber  truss blocking.
B. Structural Specifications: Reference both Sections included herein and Structural Drawings S 0.1 & S 0.2.

1.02 REFERENCE STANDARDS

1.03 DESIGN REQUIREMENTS
A. Design and laminate members in accordance with AITC 117.
B. Design and laminate members in accordance with standard engineering practice and meet requirements of National Design Specification for Wood, 1984Bullnosed. Design shall be under the supervision of a registered professional engineer.

1.04 SUBMITTALS
A. See Section 01 3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Product Data: Provide technical data on wood preservative materials, application technique and resultant performance information.

1.05 QUALITY ASSURANCE
A. Manufacturer/Fabricator Qualifications: Company specializing in manufacture of glue laminated structural units with three years of documented experience, and certified by AITC in accordance with AITC A190.1.
B. Certifications: Identify Lumber by grade stamp or stamps noting name and plant number of Manufacturer, grade, National Research Board report Number, and quality control agency.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Protect members to Manufacturers instructions for individually wrapped. Keep dry and provide supports to keep members off floor.
B. Leave individual wrapping in place until enclosed and protected in the structure. Split plastic wrappers of members stored encased in plastic on bottom side to allow for air circulation.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Glued-Laminated Structural Units:
   5. Substitutions: See Section 01 6000 - Product Requirements.
2.02 GLUED-LAMINATED UNITS
   A. Glued-Laminated Units: Fabricate in accordance with AITC 117 Industrial grade.
      1. Verify dimensions and site conditions prior to fabrication.
      2. Cut and fit members accurately to length to achieve tight joint fit.
      3. Do not splice or join members in locations other than those indicated without permission.

2.03 MATERIALS
   A. Vertical Lamination Members (such as Microllam):
      1. Lumber: Softwood lumber conforming to RIS grading rules with 12 percent maximum moisture content before fabrication. Design for the following values:
         a. Bending (Fb): 2600 psi.
         b. Compression Parallel to Grain (Fc): 2460 psi.
         c. Compression Perpendicular to Grain Bottom (Fc1): 750 psi.
         d. Horizontal Shear (Fv): 285 psi.
         e. Modulus of Elasticity (G): 112,500 psi.
         f. Modulus of Elasticity (E): 1,800,000 psi.
   B. Horizontal Lamination Members (such as Parallam):
      1. Lumber: Softwood lumber conforming to RIS (GR) grading rules with 12 percent maximum moisture content before fabrication. Design for the following values:
         a. Bending (Fb): 2900 psi.
         b. Compression Parallel to Grain (Fc): 2900 psi.
         c. Compression Perpendicular to Grain Bottom (Fc1): 650 psi.
         d. Horizontal Shear (Fv): 290 psi.
         e. Modulus of Elasticity (G): 125,000 psi.
         f. Modulus of Elasticity (E): 2,000,000 psi.

2.04 FABRICATION
   A. Fabricate glue laminated structural members in accordance with Industrial standards & grades.
   B. Verify dimensions and site conditions prior to fabrication.
   C. Cut and fit members accurately to length to achieve tight joint fit.
   D. Fabricate member with camber built in.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that supports are ready to receive units.
   B. Verify sufficient end bearing area.

3.02 PREPARATION
   A. Coordinate placement of bearing items.

3.03 ERECTION
   A. Lift members using protective straps to prevent visible damage.
   B. Set structural members level and plumb, in correct positions or sloped where indicated.
   C. Provide temporary bracing and anchorage to hold members in place until permanently secured.
   D. Fit members together accurately without trimming, cutting, splicing, or other unauthorized modification.
   E. Swab and seal the interior wood surfaces of field drilled holes in members with primer.
3.04 TOLERANCES
   A. Framing Members: 1/2 inch maximum from true position.

   END OF SECTION
SECTION 07 1113
BITUMINOUS DAMP PROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Bituminous dampproofing.
   B. Protection boards.

1.02 RELATED REQUIREMENTS
   A. Section 02204 - Fill and Backfill.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS
   A. See Section 01 3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
   B. Product Data: Provide properties of primer, bitumen, and mastics.
   C. Manufacturer’s Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.05 QUALITY ASSURANCE
   A. Installer Qualifications: Company specializing in performing the work of this section with at least three years of documented experience.

1.06 FIELD CONDITIONS
   A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application until dampproofing has cured.

PART 2 PRODUCTS

2.01 MANUFACTURERS
   A. Other Acceptable Bituminous Dampproofing Manufacturers:
      3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 COLD ASPHALTIC MATERIALS
   A. Bitumen: Emulsified asphalt, ASTM D-4479, Type I with fiber reinforcement (Type I or II).
   C. Sealing Mastic: Asphalt roof cement, ASTM D2822, Type I.
2.03 ACCESSORIES
   A. Protection Board: 1/8 inch thick biodegradable hardboard.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify existing conditions are acceptable prior to starting this work.
   B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing system.
   C. Verify that items penetrating surfaces to receive dampproofing are securely installed.

3.02 APPLICATION
   A. Prime surfaces in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.
   B. Apply bitumen with mop.
   C. Apply bitumen at top of footings, between the footing and the foundation wall, before foundation wall concrete forms are set in place.
   D. Apply bitumen in one coat, continuous and uniform, at a rate of 4 gal/100 sq ft per coat.
   E. Apply from 2 inches below finish grade elevation down to top of footings.
   F. Seal items watertight with mastic, that project through dampproofing surface.
   G. Tools and other equipment shall be cleaned with mineral spirits, taking all necessary precautions with handling of combustible materials.
   H. Allow film to cure at least 24 to 48 hours prior to backfilling. Care shall be taken to avoid damage or penetration of the coating.
   I. Coordinate placement of protection board directly over dampproofing, butt joints, and adhere to tacky dampproofing.
   J. Scribe and cut boards around projections, penetrations, and interruptions.

END OF SECTION
SECTION 07 2100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Board insulation at perimeter foundation wall and underside of floor slabs where shown.
   B. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.
   C. Truss Baffles to allow ventilation to reach the attic and ridge vent.

1.02 RELATED REQUIREMENTS
   A. Section 06 1000 - Rough Carpentry: Supporting construction for batt insulation.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS
   A. See Section 01 3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
   B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
   C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

PART 2 PRODUCTS

2.01 FOAM BOARD INSULATION MATERIALS
   A. Extruded Polystyrene Board Insulation: Extruded polystyrene board; ASTM C578; with either natural skin or cut cell surfaces, and the following characteristics:
      1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
      2. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
      3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
      4. R-value; 1 inch of material at 72 degrees F: 5, minimum.
      5. Board Size: 24 x 96 inch.
      7. Thermal Conductivity (k factor) at 25 degrees F: 0.18.
      10. Water Absorption, Maximum: 0.3 percent, by volume.
      11. Manufacturer: Dow or Formular or Equal.
2.02 BATT INSULATION MATERIALS

A. Batt Insulation: ASTM C 665; preformed glass fiber batt; conforming to the following:
   1. Locations:
      a. Exterior Walls @ 2x6 Studs.
   3. Thickness: 5.5 inch.
   5. Facing: Unfaced.
   6. Manufacturers:
   7. Substitutions: See Section 016000 - Product Requirements.

B. Batt Insulation: ASTM C 665; preformed glass fiber batt; friction fit, conforming to the following:
   1. Locations:
      a. Wood Trusses - At bottom cord of the trusses..
   3. Thickness: 12 inch.
   4. Width: 24 inches
   5. Facing: Faced on one side with aluminum foil.
   6. Manufacturers:
   7. Substitutions: See Section 01 6000 - Product Requirements.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.03 ACCESSORIES

A. Interior Vapor Retarder: Modified polyethylene/polyacrylate (PE/PA) film reinforced with polyethylene terephthalate (PET) fibers, 12 mils, 0.012 inch thick.
   1. Width: 4.9 feet.
   2. Manufacturers:
      a. SIGA Cover Inc; SIGA-Majrex: www.sigacover.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

B. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
   1. Application: Sealing of interior circular penetrations, such as pipes or cables.
   2. Width: Are required for application.
   3. Temperature Resistance: Minus 40 degrees F to 212 degrees F
   4. Manufacturers:
      a. SIGA Cover Inc; SIGA-Rissan: www.sigacover.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

C. Ventilation Baffles: Formed Plastic.

D. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER
A. Apply adhesive to back of boards:
   1. Three continuous beads per board length.
B. Install boards both vertical and horizontal on foundation perimeter where indicated on wall sections.
   1. Place boards to maximize adhesive contact.
   2. Install in running bond pattern.
   3. Butt edges and ends tightly to adjacent boards and to protrusions.
C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION UNDER CONCRETE SLABS
A. Place insulation under slabs on grade after base for slab has been compacted. (2 feet in from perimeter as detailed. This requirement is for exterior perimeter of the office building only.)
B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.04 BATT INSTALLATION
A. Install insulation, and vapor retarder in accordance with manufacturer's instructions.
B. Provide two rows of stick pin fasteners in each cavity at 24 inches on center or less to prevent sag.
C. Impale insulation batts over stick pins.
D. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.
E. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
F. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
G. Install with factory applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.
H. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.
I. At wood framing, place vapor retarder on warm side of insulation by stapling at 6 inches on center. Lap and seal sheet retarder joints over member face.
J. Tape seal tears or cuts in vapor retarder.
K. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane. Tape seal in place.

3.05 PROTECTION
A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION
SECTION 07 2500
WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Air Barriers: Materials that form a system to stop passage of air through exterior walls.

1.02 RELATED REQUIREMENTS
A. Section 07 2100 - Thermal Insulation: Vapor retarder installed in conjunction with batt insulation.

1.03 DEFINITIONS
A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.
B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.
C. Vapor Retarder: Air tight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.
   1. Water Vapor Permeance: For purposes of conversion, 57.2 ng/(Pa s sq m) = 1 perm.
D. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture resistant, to the degree specified, intended to be installed to shed water without sealed seams.

1.04 REFERENCE STANDARDS
J. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2011.

1.05 SUBMITTALS
A. See Section 01 3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Product Data: Provide data on material characteristics.
C. Shop Drawings: Provide drawings of special joint conditions.
D. Manufacturer's Installation Instructions: Indicate preparation.

1.06 FIELD CONDITIONS
A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.01 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)
A. Air Barrier Sheet, Mechanically Fastened:
   1. Air Permeance: 0.004 cubic feet per minute per square foot, maximum, when tested in accordance with ASTM E2178.
   2. Water Vapor Permeance: 5 perms, minimum, when tested in accordance with ASTM E96/E96M Procedure A (desiccant procedure).
   3. Water Penetration Resistance: Withstand a water head of 21 inches, minimum, for minimum of 5 hours, when tested in accordance with AATCC Test Method 127.
   4. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 180 days of weather exposure.
   5. Ultraviolet and Weathering Resistance: Approved in writing by manufacturer for minimum of 9 months weather exposure.
   6. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke developed index of 50 or less, when tested in accordance with ASTM E84.
   7. Seam and Perimeter Tape: Polyethylene self adhering type, mesh reinforced, 2 inches wide, compatible with sheet material; unless otherwise specified.
   8. Products:
      d. VaproShield, LLC; WrapShield: www.vaproshield.com.

2.02 SEALANTS
A. Primers, Cleaners, and Other Sealant Materials: As recommended by sealant manufacturer, appropriate to application, and compatible with adjacent materials.

2.03 ACCESSORIES
A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.
B. Thinners and Cleaners: As recommended by material manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify that surfaces and conditions are ready to accept the work of this section.
3.02 PREPARATION
   A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
   B. Clean and prime substrate surfaces to receive adhesives in accordance with manufacturer's instructions.

3.03 INSTALLATION
   A. Install materials in accordance with manufacturer's instructions.
   B. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
   C. Mechanically Fastened Sheets - On Exterior windows and door frames:
      1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
      2. Overlap seams as recommended by manufacturer but at least 6 inches.
      3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches.
      4. For applications specified to be air tight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners recommended by the manufacturer.
      5. Install air barrier and vapor retarder UNDER jamb flashings.
      6. Install head flashings under weather barrier.
      7. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.
   D. Openings and Penetrations in Exterior Weather Barriers:
      1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
      2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
      3. At openings to be filled with non-flanged frames, seal weather barrier to all sides of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
      4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
      5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
      6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 FIELD QUALITY CONTROL
   A. See Section 01 4000 - Quality Requirements, for additional requirements.
   B. Obtain approval of installation procedures by the weather barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.
   C. Take digital photographs of each portion of the installation prior to covering up.

3.05 PROTECTION
   A. Do not leave materials exposed to weather longer than recommended by manufacturer.
   B. Do not leave paper- or felt-based barriers exposed to weather for longer than one week.

END OF SECTION
SECTION 07 4114
METAL ROOF PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Standing Seam, Prefinished Roofing.
B. Architectural roofing system of preformed steel panels.
C. Self Adhering Underlayment over sheathing.
D. Counterflashings.
E. Ridge Cap.
F. Gutters and downspouts.
G. Integral fascias.
H. Fastening system.
I. Accessories and miscellaneous components.

1.02 RELATED REQUIREMENTS
A. Section 06 1000 - Rough Carpentry: Roof sheathing.
B. Section 07 2100 - Thermal Insulation: Rigid roof insulation.
C. Section 07 4213 - Metal Wall Panels: Preformed wall panels.
D. Section 07 6200 - Sheet Metal Flashing & Trim: Placement of flashing and accessories.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS
A. See Section 01 3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Summary of test results, indicating compliance with specified requirements.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Specimen warranty.
   5. Provide data on metal types, finishes, characteristics, and rib anchors.
C. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
1. Show work to be field-fabricated or field-assembled.
2. Include structural analysis signed and sealed by qualified structural engineer, indicating conformance of roofing system to specified loading conditions.

D. Selection Samples: For each roofing system specified, submit color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each roofing system specified, submit samples of minimum size 12 inches square, representing actual roofing metal, thickness, profile, color, and texture.
   1. Include typical panel joint in sample.
   2. Include typical fastening detail.

F. Test Reports: Indicate compliance of metal roofing system to specified requirements.

G. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in ITD's name and are registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in the manufacture of roofing systems similar to those required for this project, with not less than 5 years of documented experience.

B. Installer Qualifications: Company trained and authorized by roofing system manufacturer.

C. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise noted.
   1. Maintain one copy on project site.

D. Field Measurements: Where possible, prior to fabrication of prefabricated panels, take field measurements of structure of substrates to receive panel system. Allow for trimming panel units where final dimensions cannot be established prior to fabrication.

1.06 PERFORMANCE

A. Required Performances: Fabricate panels and other components of roof system for the following installed-as indicated performances:
   1. Roof Loading: 40 lbs per sq. ft inward; 25 lbs per sq ft outward.
   2. Water Penetration: No significant, uncontrolled leakage at 4 lbs per sq ft pressure with spray test.
   3. Air Infiltration: 0.02 cfm per sq ft for gross roof/wall areas, with 4 lbs per sq ft differential pressure.

B. Expansion: System shall be designed to allow sliding expansion / contraction without stressing the attachments or forcing movement in the rib / clip interface.

C. Details shall be manufacturers standards except where shown more stringently on the Drawings. Where detailing shown on the drawings exceeds in quality that of the Manufacturers standard recommendations, the Contractor will be required to provide the detail in substantially its upgraded form (ie: sidelap sealants are required in each rib regardless of manufacturer's standard practice).

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Warranty & Guarantees
   1. Roofing Warranty: Roofing Contractor shall issue a Five year roofing warranty covering conditions as stated in warranty provided herein. Said Warranty is included at the end of this Section.
   2. Guarantee for Standing Seam Metal Roofing: The roofing manufacturer shall issue a standard manufacturer's ten year water-tight Roofing Guarantee.
3. Roofing Material Finish: Manufacturer shall issue a twenty year guarantee for the galvalume finish on the roofing material. Guarantee shall be issued on Manufacturer's standard form and approved by the Architect before installation of materials.

4. See Section 01780 - Closeout Submittals, for additional warranty requirements.

1.09 PRE-INSTALLATION MEETING

A. Convene one week before starting work of this section.

1.10 DELIVERY, STORAGE, AND PROTECTION

A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials which may cause discoloration or staining.

PART 2 PRODUCTS

2.01 MANUFACTURER FOR STANDING SEAM SYSTEM


D. LokSeam Panel is the design standard design, snaplock seamed.
   2. Dimensions: 16 inch on center Standing Seam x 1 3/4 inch high rib.
   5. Color as selected by Architect.

E. Substitutions: See Section 01 6000 - Product Requirements.

2.02 STANDING SEAM ROOF PANELS

A. Structural Metal Roofing: Provide complete roofing assemblies, including roof panels, clips, fasteners, connectors, and miscellaneous accessories, tested for conformance to the following minimum standards:
   1. Structural Design Criteria: Provide panel assemblies designed to safely support design loads at support spacing indicated, with deflection not to exceed 1/180 of the span when tested in accordance with ASTM E1592.
   2. Overall: Complete weathertight system tested and approved in accordance with ASTM E1592.
   3. Wind Uplift: Class 90 wind uplift resistance of UL 580.
   4. Air Infiltration: Maximum 0.06 cfm/sq ft at air pressure differential of 6.24 lbf/sq ft, when tested according to ASTM E1680.
   5. Water Penetration: No water penetration when tested according to procedures and recommended test pressures of ASTM E1646. Perform test immediately following air infiltration test.
   6. Thermal Movement: Design system to accommodate without deformation anticipated thermal movement over ambient temperature range of 100 degrees F.

B. Surface Finish: UL-580 Class 90, Roll-formed acrylic coated.

2.03 ATTACHMENT SYSTEM

A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.
2.04 FLASHINGS & TRIM
A. Flashings and Trim at perimeter wall caps (ie, any exposed to view flashings) shall be fabricated from color / gage matching material and supplied / installed by this section.
B. Fabricate sheet metal with standing seams and flat - lock seams.
C. Coat back side of fabricated sheet metal with 15 mil sulfur-free bituminous coating, FS TT-C-494, or SSPC Paint 12, where required to separate metals from corrosive substrates including cementitious materials, wood, or other absorbent materials; or provide other permanent separation.
D. Provide for thermal expansion of running sheet metal work, by overlaps or expansion joints in fabricated work. Where required for water-tight construction, provide hooded flanges filled with polyisobutylene mastic for 1 inch embedment of flanges.

2.05 ACCESSORIES AND MISCELLANEOUS ITEMS
A. Miscellaneous Sheet Metal Items: Provide flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, and equipment curbs of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.
B. Provide manufacturer’s standard, standard and accessories as required for a complete installation including trim, copings, fascia, flashings, corner units, ridge closures, clips, seam closures, battens, gaskets, sealants, and similar items.
1. Fasteners: Galvanized steel, with soft neoprene washers. Manufacturer standard. Any exposed fastener shall be specifically illustrated on the shop drawings.
2. Plumbing Vent penetrations shall be flashed with Dektite EPDM rubber sleeves or equal by Master Flash. Install in field of metal panels only.
C. Self Adhering Flexible Underlayment: Self-adhering polymer-modified asphalt sheet complying with ASTM D 1970; 40 mil total thickness; with strippable treated release paper and smooth asphalt top surface as shown on drawings.
1. Manufacturers:
   a. Henry; Product Blueskin RF200.
   b. Protecto Wrap Company; Product Ice & Water Guard.
   c. W.R. Grace; Product Ice & Water Shield.
E. Slip Sheet: Rosin sized building paper.
F. Rib and Ridge Closures: Provide prefabricated, close-fitting components of steel with corrosion resistant finish or combination steel and closed-cell foam.
G. Sealants:
1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
2. Concealed Sealant: Non-curing butyl sealant or tape sealant.
H. Seam Sealant Tape: Equal to MBCI Tape Sealer # HW-500 Double Bead, 7/8” x 3/16” thick. Provide continuous seam sealant at all panel end lap and side lap joints.
J. Rain Gutters and Downspouts:
1. Gutters: Equal to MBCI Box Eave Gutter # FL-14G with end caps and downspout transitions in color selected.
2. Downspouts: Rectangular open faced downspouts with associated straps at 48 inches on center vertically. Provide downspouts in color selected.
3. Fascia & Trim: Custom fabricated to match details.
2.06 FABRICATION

A. Panels: Fabricate panels and accessory items at factory, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.

B. Fabricate and finish panels and accessories at factory to greatest extent possible, by manufacturers standard procedures and processes to produce panels of type indicated and to comply with indicated profiles, and to dimensional performance requirements indicated.

C. Form sections true to shape, accurate in size, square, and free from distortion or defects.

D. Fabricate cleats of same material as sheet, one gage thicker than roofing sheet, minimum 2 inches wide, interlockable with sheet.

E. Form pieces in longest practical lengths.

F. Hem exposed edges on underside 1/2 inch; miter and seam corners.

G. Form material with standing seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

H. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

2.07 FACTORY FINISHING (FOR EXPOSED FASCIA, GUTTERS AND DOWNSPOUTS.)

A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.02 inch thick base metal.

B. Primer Coat: On coated sheets, finish concealed side of sheet with primer compatible with finish system as recommended by finish system manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect roof deck to verify deck is clean and smooth, free of depressions, waves, or projections, properly sloped to eaves.

B. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.

C. If substrate preparation is the responsibility of another installer, notify JHS Architects of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Broom clean wood sheathing prior to installation of roofing system.

B. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to assure that the completed roof will be free of leaks.

C. Install starter and edge strips, and cleats before starting installation.

D. Back paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.

E. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by roof panel manufacturer.

F. Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.03 INSTALLATION - EAVE (ICE DAM) PROTECTION

A. Apply eave protection sheet in accordance with manufacturer's instructions.

B. Extend eave protection sheet minimum 4 feet upslope beyond interior face of exterior wall.

3.04 INSTALLATION - UNDERLAYMENTS

A. Apply underlayment over entire roof area.
1. Apply in single layer laid perpendicular to slope; weather lap edges 2 inches and nail in place.
2. Minimize nail quantity.

B. Apply slip sheet in one layer, laid loose.
C. Cleat and seam all joints.

3.05 INSTALLATION - GENERAL

A. Overall: Install roofing system in accordance with approved shop drawings and panel manufacturer's instructions and recommendations, as applicable to specific project conditions. Anchor all components of roofing system securely in place while allowing for thermal and structural movement.
   1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
   2. Minimize field cutting of panels. Where field cutting is absolutely required, use methods that will not distort panel profiles. Use of torches for field cutting is absolutely prohibited.

B. Accessories: Install all components required for a complete roofing assembly, including flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, equipment curbs, rib closures, ridge closures, and similar roof accessory items.

C. Install roofing felt and building paper slip sheet on roof deck before installing preformed metal roof panels. Secure by methods acceptable to roof panel manufacturer, minimizing use of metal fasteners. Apply from eaves to ridge in shingle fashion, overlapping horizontal joints a minimum of 2 inches and side and end laps a minimum of 3 inches. Offset seams in building paper and seams in roofing felt.

D. Roof Panels: Install panels in strict accordance with manufacturer's instructions, minimizing transverse joints except at junction with penetrations.
   1. Form weathertight standing seams incorporating concealed clips, using an automatic mechanical seaming device approved by the panel manufacturer.
   2. Incorporate concealed clips at panel joints, and apply snap-on battens to provide weathertight joints.
   3. Provide sealant tape or other approved joint sealer at lapped panel joints.
   4. Install sealant or sealant tape, as recommended by panel manufacturer, at end laps and side joints.

3.06 CLEANING

A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.07 INSTALLATION - STANDING SEAM ROOFING

A. Comply with panel manufacturers instructions for anchorage, joint sealers, flashing and trim for the proper and permanent installation of panels, with provisions for thermal expansion, erected in panel pattern indicated. Conceal fasteners by use of laps and joint clips.

B. Tolerances: Shim and align panel units within installed tolerance of 1/4 inch in 20 feet on level / plumb / slope and location / line as indicated, and within 1/8 inch offset of adjoining faces and of matching profiles.

C. Space standing seams at 16 inch on center.

D. Lay sheets with long dimension perpendicular to eaves. Apply pans beginning at eaves.

E. Install gaskets, joint fillers and sealants where indicated for waterproof performance of the panel systems. Provide types of gaskets and sealants / fillers indicated or types recommended by panel manufacturer.

F. Rigidly attach panels to roofs at eaves. Other attachments shall allow movement toward the ridge.

G. Lock cleats into seams.
H. Seam panels together in manner recommended by manufacturer.
I. Stagger transverse joints of roofing sheets.
J. At eaves and gable ends, terminate roofing by hooking over edge strip.
K. Finish standing seams 2 1/2 inch high on flat surfaces (minimum).
L. Fold lower ends of seams at eaves over at 45 degree angle.
M. Terminate standing seams at ridge and hips by turning down with tapered fold or PVC closure.
N. Form valleys of sheets not exceeding 10 feet in length. Lap joints 6 inches in direction of drainage.
O. Extend valley sheet minimum 6 inches under roofing sheets.
P. At valley, double fold valley and roofing sheets and secure with cleats spaced 18 inches on center.

3.08 INSTALLATION - GUTTERS AND DOWNSPOUTS

A. EXAMINATION
   1. Verify existing conditions before starting work.
   2. Verify that surfaces are ready to receive work.

B. PREPARATION
   1. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.

C. INSTALLATION
   1. Install gutters, downspouts, and accessories.
   2. Sheet Metal: Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.
   3. Longitudinal joints not acceptable.
   4. Secure gutter lining to substrate with cleats spaced minimum 24 inches on center along edges of gutters.
   5. Slope gutters 1/64 inch per foot, 1 percent minimum.
   6. Solder metal joints for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.
   7. Connect downspouts to storm sewer system. Seal connection watertight.
   8. Seal gutters watertight. Seal joint of gutter to drain.

3.09 INSTALLATION - FLASHINGS

A. Secure flashings in place using concealed fasteners.
B. Cleat and seam all joints.
C. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
D. Install copolymer roof vent caps over plumbing VTR’s. Comply with manufacturers recommendations.
E. Seal metal joints watertight.

3.10 PROTECTION

A. Do not permit traffic over unprotected roof surface.
B. Replace Damaged Panels and other components of the work which have been damaged or have deteriorated beyond successful repair by means of finish touch-up or similar minor repair procedures.
C. Clean finished surfaces as recommended by panel manufacturer, and maintain in a clean condition during construction.
D. Protect the installation by advising the contractor of protection and surveillance procedures, as required to insure that work of this Section will be without damage or deterioration at time of substantial completion.

3.11 CLEANING AND PROTECTION
A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.12 ROOFING WARRANTY
A. To: Idaho Transportation Department
B. RE: ITD - Brine Facility, Shoshone, Idaho
C. We, the undersigned General Contractor, and Roofing & Sheet Metal Subcontractors hereby individually guarantee for a period of Five (5) years to replace and defective material, and to repair any leaks or other faults that may develop in materials or workmanship. The cost of all labor and materials required to fulfill this guarantee will be borne by the undersigned.

D. In case the repairs are not made or defective parts replaced within ten (10) days from the date of written notice from the Owner may have such repairs made or material replaced as required and the undersigned agree to pay all costs inside of thirty (30) days from the date repairs are made and material replaced.

E. Attached hereto is a fully executed Manufacturers Watertightness Guarantee for a 10 year term.

F. Attached hereto is a fully executed galvalume finish guarantee for a 20 year term.

GENERAL CONTRACTOR Date
ROOFING CONTRACTOR Date
SHEET METAL CONTRACTOR Date

END OF SECTION
SECTION 07 4214
METAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Manufactured metal panels for walls, with related flashings and accessory components.

1.02 RELATED REQUIREMENTS
   A. Section 06 1000 - Rough Carpentry: Wall panel substrate and extra stud blocking.
   B. Section 07 2500 - Weather Barriers: Weather barrier under wall panels.
   C. Section 07 9005 - Joint Sealers.

1.03 REFERENCE STANDARDS
   A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

1.04 DESIGN REQUIREMENTS
   A. Components: Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall. Design pressure of 24 lb/sq ft.
   B. Maximum Allowable Deflection of Panel: 1/180 of span.
   C. Provide continuity of air barrier and vapor retarder seal at building enclosure elements in conjunction with materials specified in Section 07 2500.

1.05 SUBMITTALS
   A. See Section 01 3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
   B. Shop Drawings: Indicate dimensions, layout, joints, construction details, methods of anchorage.
   C. Samples: Submit two samples of wall panel, 8 inch by 12 inch in size illustrating finish color, sheen, and texture.

1.06 QUALITY ASSURANCE
   A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
   B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of experience.

1.07 DELIVERY, STORAGE, AND HANDLING
   A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
   B. Store prefinished material off ground and protected from weather. Prevent twisting, bending, or abrasion, and provide ventilation to stored materials. Slope metal sheets to ensure drainage.
   C. Prevent contact with materials that may cause discoloration or staining of products.

1.08 WARRANTY
   A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
   B. Correct defective work within a five year period after the Date of Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.
C. Correct defective Work within a five year period after the Date of Substantial Completion, including defects in water tightness and integrity of seals.

PART 2 PRODUCTS

2.01 MANUFACTURED METAL PANELS

A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
   1. Provide exterior panels, interior liner panels, soffit panels, and subgirt framing assembly.
   2. Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall.
   3. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
   4. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
   5. Corners: Factory-fabricated in one continuous piece with minimum 18 inch returns.

B. Exterior Panels:
   1. Profile: Vertical; MBCI - PBR Panel style.
   2. Side Seams: Double-interlocked, tight-fitting, sealed with continuous gaskets.
   3. Material: Precoated steel sheet, 26 gage, 0.0179 inch minimum thickness.
   5. Finish: UL-580 Class 90, Roll-formed acrylic coated Galvalume.

C. Soffit Panels:
   1. Profile: Perforated Panels for attic ventilation.
   2. Material: Option - Precoated steel sheet, 22 gage, 0.0299 inch minimum thickness.
   3. Material: Option - Precoated aluminum sheet, 20 gage, 0.032 inch minimum thickness.

D. External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system. Manufacturers standard corner trim units.

E. Trim: Same material, thickness and finish as exterior sheets.

F. Anchors: Galvanized steel.

2.02 MATERIALS

A. Precoated Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M Structural Steel (SS) or Forming Steel (FS), with G90/Z275 coating; continuous coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

B. Precoated Aluminum Sheet: ASTM B209 (ASTM B209M), 3105 alloy, O temper, smooth surface texture; continuous-coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

2.03 ACCESSORIES

A. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant.

B. Sealants:
   1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
   2. Concealed Sealant: Non-curing butyl sealant or tape sealant.

C. Sealants: As specified in Section.

D. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, steel, hot dip galvanized. Fastener cap same color as exterior panel.

E. Field Touch-up Paint: As recommended by panel manufacturer.

F. Bituminous Paint: Asphalt base.
2.04 FABRICATION
   A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
   B. Form pieces in longest practicable lengths.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that building framing members are ready to receive panels.
   B. Verify that weather barrier has been installed over substrate completely and correctly.

3.02 INSTALLATION
   A. Install panels on walls in accordance with manufacturer's instructions.
   B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.
   C. Fasten panels to structural supports (wall studs) or blocking; aligned, level, and plumb.
   D. Locate joints over supports. Lap panel ends minimum 2 inches.
   E. Drill for exposed fasteners in "gang stack" to assure alignment of fasteners on the wall.
   F. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.03 TOLERANCES
   A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.
   B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch.

3.04 CLEANING
   A. Remove site cuttings from finish surfaces.
   B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

END OF SECTION
SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Miscellaneous flashings shown.

1.02 RELATED REQUIREMENTS
A. Section 06 1000 - Rough Carpentry: Wood nailers for sheet metal work.
B. Section 06 1000 - Carpentry: Rigid foam insulation board under metal siding only.

1.03 REFERENCE STANDARDS
A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

1.04 SUBMITTALS
A. See Section 01 3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details if different from architectural details.
C. Samples: Submit two samples, 12" x 12" inch in size illustrating material & typical finish.

1.05 QUALITY ASSURANCE
A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.
B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS
A. Concealed Flashings and attachment cleats:
   1. Galvanized Steel @ concealed flashings: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.02 inch (27 ga) thick base metal.
   2. Galvanized Steel @ attachment cleats or clips: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.034 inch (22 ga) thick base metal.
2.02 ACCESSORIES
A. Fasteners: Stainless steel, with soft neoprene washers.
B. Underlayment: ASTM D226/D226M, organic roofing felt, Type I ("No. 15").
C. Sealant to be Concealed in Completed Work: Non-curing butyl sealant.
D. Sealant to be Exposed in Completed Work: ASTM C920; elastomeric sealant, 100 percent silicone with minimum movement capability of plus/minus 25 percent and recommended by manufacturer for substrates to be sealed; clear.
E. Sealant: Types 2 specified in Section 07 9005, depending on application.
F. Plastic Cement: ASTM D4586/D4586M, Type I.

2.03 FABRICATION
A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
B. Form pieces as detailed.
C. Hem exposed edges on underside 1/2 inch; miter and seam corners.
D. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
E. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION
A. Install starter and edge strips, and cleats before starting installation.
B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION, GENERAL
A. Conform to drawing details.
B. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.
C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
D. Seal metal joints watertight.

3.04 INSTALLATION, METAL WALL PANELS
A. Install metal siding system with exposed gasketed screw-type fasteners.
B. Provide fasteners as shown or larger to assure wind induced pull-out loads.

3.05 FIELD QUALITY CONTROL
A. See Section 01 4000 - Quality Requirements, for field inspection requirements.
B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Sealants and joint backing.
   B. Sealants associated with Weather Barrier (Section 07 2727) are not included in this Section.
   C. Sealants involving buildings, slabs, openings, etc.

1.02 RELATED REQUIREMENTS
   A. Sealants required in conjunction with air barriers and vapor retarders:
   B. Section 08 8000 - Glazing: Glazing sealants and accessories.
   C. Section 09 2116 - Gypsum Board Assemblies: Acoustic sealant.

1.03 REFERENCE STANDARDS
   E. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.

1.04 ADMINISTRATIVE REQUIREMENTS
   A. Coordinate the work with other sections referencing this section.

1.05 SUBMITTALS
   A. See Section 01 3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
   B. Product Data: Provide data indicating sealant chemical characteristics.
   C. Manufacturer's Installation Instructions: Indicate special procedures.

1.06 QUALITY ASSURANCE
   A. Maintain one copy of each referenced document covering installation requirements on site.
   B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
   C. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years documented experience and approved by manufacturer.

1.07 FIELD CONDITIONS
   A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.08 WARRANTY
   A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
   B. Correct defective work within a five year period after Date of Substantial Completion.
   C. Warranty: Include coverage for installed sealants and accessories which fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.
PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Silicone Sealant: Mildew Resistant
   5. Red Devil; 100% Silicone Industrial Grade RTV Sealant: www.reddevil.com.

B. Polyurethane Sealant: Chemical Resistant
   4. Substitutions: See Section 01 6000 - Product Requirements.

C. Polyurethane Sealant: Trafficable

D. Acrylic Sealants (ASTM C920):

E. Butyl Sealants:
   6. BASF Corp.; Product MasterFlex 350.
   7. Substitutions: See Section 01 6000 - Product Requirements.

F. Preformed Compressible Foam Sealers:

2.02 SEALANTS

A. Sealants and Primers - General: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.
B. Type 1 - General Purpose Exterior Sealant: Polyurethane; ASTM C920, Grade NS, Class 25 minimum; Uses M, G, and A; single component.
   1. Color: To be selected by JHS Architects from manufacturer’s standard range.
   2. Applications: Use for:
      a. Control, expansion, and soft joints in masonry.
      b. Joints between concrete and other materials.
      c. Joints between metal frames and other materials.
      d. Other exterior joints for which no other sealant is indicated.

C. Type 2 - Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, nondrying, non-skinning, non-curing.
   1. Product: Storm Blaster All Season Sealant manufactured by Sherwin-Williams.
   2. Applications: Use for:
      a. Concealed sealant bead in sheet metal work.
      b. Concealed sealant bead in siding overlaps.

D. Type 3 - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable.
   1. Color: To be selected by JHS Architects from manufacturer’s standard range.
   2. Applications: Use for:
      a. Interior wall and ceiling control joints.
      b. Joints between door and window frames and wall surfaces.
      c. Other interior joints for which no other type of sealant is indicated.

E. Type 4 - Interior Floor Joint Sealant: Polyurethane, self-leveling; ASTM C920, Grade P, Class 25, Uses T, M and A; single component.
   1. Approved by manufacturer for wide joints up to 1-1/2 inches.
   2. Color: To be selected by JHS Architects from manufacturer’s standard range.
   3. Product: Sonolastic NP1 manufactured by BASF Corp.
   4. Applications: Use for:
      a. Expansion joints in floors in animal areas.
      b. Wall to Floor joint in animal areas.

2.03 ACCESSORIES
   A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
   B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
   C. Joint Backing: Round foam rod compatible with sealant; ASTM D1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.
   D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that substrate surfaces are ready to receive work.
   B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION
   A. Remove loose materials and foreign matter that could impair adhesion of sealant.
   B. Clean and prime joints in accordance with manufacturer's instructions.
   C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
   D. Protect elements surrounding the work of this section from damage or disfigurement.
3.03 INSTALLATION
   A. Perform work in accordance with sealant manufacturer’s requirements for preparation of surfaces and material installation instructions.
   B. Perform installation in accordance with ASTM C1193.
   C. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
      2. Neck dimension no greater than 1/3 of the joint width.
      3. Surface bond area on each side not less than 75 percent of joint width.
   D. Install bond breaker where joint backing is not used.
   E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
   F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
   G. Tool joints concave.
   H. Precompressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch below adjoining surface.

3.04 CLEANING
   A. Clean adjacent soiled surfaces.

3.05 PROTECTION
   A. Protect sealants until cured.

3.06 SCHEDULE
   A. Exterior Joints for Which No Other Sealant Type is Indicated: Type 1; colors as shown on drawings.
   B. Lap Joints in Exterior Sheet Metal Work: Type 2.
   C. Butt Joints in Exterior Metal Work and Siding: Type 1.
   D. Under Exterior Door Thresholds: Type 1.
   E. Interior Joints for Which No Other Sealant is Indicated: Type 3.
   F. Control and Expansion Joints in Interior Concrete Slabs and Floors: Type 4.

END OF SECTION
SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Non-fire-rated steel frames for exterior applications with urethane foam insulation fill.
B. Thermally insulated steel doors at exterior applications.

1.02 RELATED REQUIREMENTS
A. Section 08 7100 - Door Hardware.

1.03 REFERENCE STANDARDS
B. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.
D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

1.04 SUBMITTALS
A. See Section 01 3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.
C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

PART 2 PRODUCTS

2.01 DESIGN CRITERIA
A. Hollow Metal Panels: Same construction, performance, and finish as doors.
B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.
2.02 HOLLOW METAL DOORS

A. Exterior Doors:
   1. Based on NAAMM HMMA Custom Guidelines:
      a. Comply with guidelines of NAAMM HMMA 860 for Hollow Metal Doors and Frames.
      b. Performance Level 1 - Light Duty, in accordance with NAAMM HMMA 805.
      c. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.
   2. Core Material: Manufacturers standard core material/construction and in compliance with requirements.
   5. Insulating Value: U-value of 0.50, when tested in accordance with ASTM C1363.
   6. Weatherstripping: Refer to Section 08 7100.

2.03 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. General:
   1. Comply with the requirements of grade specified for corresponding door.
      a. ANSI A250.8 Level 1 Doors: 16 gage frames.
   2. Finish: Same as for door.
   3. Frames Wider than 48 Inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

C. Exterior Door Frames: Full profile/continuously welded type.
   1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
   2. Weatherstripping: Separate, see Section 08 7100.

2.04 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.
B. Verify that opening sizes and tolerances are acceptable.
C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

A. Secure frame to wood studs.
B. Seal frame edges.
C. Fill Frame cavity with urethane foam on exterior frames.

3.03 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
B. Coordinate frame anchor placement with wall construction.
C. Install door hardware as specified in Section 08 7100.
3.04 TOLERANCES
   A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
   B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.05 ADJUSTING
   A. Adjust for smooth and balanced door movement.

END OF SECTION
SECTION 08 3613
SECTIONAL DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Overhead sectional doors, electrically operated.
B. See Track Configurations in Article 2.02 C below.
C. Operating hardware and supports.
D. Electrical controls.

1.02 RELATED REQUIREMENTS
A. Section 05 5000 - Metal Fabrications: Steel channel opening frame.
B. Section 07 9005 - Joint Sealers: Perimeter sealant and backup materials.
C. Division 260000 - Electrical Sections: Conduit & wiring from control units to door operator.

1.03 REFERENCE STANDARDS
A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
G. NEMA MG 1 - Motors and Generators; 2014.
H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.
C. Product Data: Show component construction, anchorage method, and hardware.
D. Samples: Submit two panel finish samples, 4 x 4 inch in size, illustrating color and finish.
E. Manufacturer's Installation Instructions: Include any special procedures required by project conditions.
F. Operation Data: Include normal operation, troubleshooting, and adjusting.
G. Maintenance Data: Include data for motor and transmission, shaft and gearing, lubrication frequency, spare part sources.
H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
1.05 DESIGN / PERFORMANCE REQUIREMENTS

A. Wind Loads: Design and size components to withstand loads caused by pressure and suction of wind acting normal to plane of wall as calculated in accordance with applicable code - 2012 IBC & ASCE 7.
   1. Design pressure determined by Wind Speed of 115 mph.
   2. IBC Exposure C.
   3. Internal Coefficient: +/- 0.55 for Partially enclosed.
   4. Internal Coefficient: +/- 0.18 for Open Buildings.
   5. Assume worst case door configuration.

B. Wiring Connections: Requirements for electrical characteristics.
   1. 115 volts, single phase, 60 Hz.

C. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years of documented experience.

B. Installer: Company specializing in performing the work of this section with minimum five years of experience.

C. Both Door and electric operator shall be manufactured by a single source producer of door systems.

D. Conform to applicable code for motor and motor control requirements.

E. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals for warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for electric motor and transmission.

D. Provide five year manufacturer warranty for electric operating equipment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Overhead Door Corporation; Product : 422 Series Heavy Duty, Steel Sectional Insulated Door.

B. Other Acceptable Manufacturers:
   1. Raynor Door.

2.02 STEEL DOOR COMPONENTS

A. Steel Doors: Flush steel, insulated; varied lift operating style with track and hardware; complying with DASMA 102, Commercial application. See "Track Configuration" below.
   1. Performance: See Paragraph 1.05
   2. Door Nominal Thickness: 2 inches thick.
   3. Exterior Finish: Ribbed 20 gauge, hot-dip galvanized, with Pre-finished baked enamel of color as selected to match metal wall panels.
   4. Insulation: Isocyanurate, 2 inches thick, R value 11.69.
   5. Interior Finish: Pre-finished with baked enamel, Color: White
6. **Glazed Lights**: Multiple glazed lights per panel; set in place with security glazing stops in panels shown on exterior elevations.
   a. Individual lites with 1/2" insulated DSB.

7. **Operation**: Electric.

B. **Door Panels**: Flush steel construction; outer steel sheet of 0.0359 inch thick, ribbed profile; inner steel sheet of 0.0179 inch thick, flat profile; core reinforcement of 2 inch thick sheet steel roll formed to channel shape, rabbeded weather joints at meeting rails; insulated.
   1. **End Stiles**: 16-guage steel.
   2. **Center Stiles**: 16-guage steel.

C. **Track Configuration**:
   1. **Standard Lift Track**
      a. **Bldg C**, (4) Doors (vehicle doors)
      b. **Bldg J**, (4) Doors
      c. **Bldg M**, (2) Doors (vertical lift 5 feet to clear crane, then horizontal or Lift Clearance optional.)
      d. **Bldg G**, (1) Doors

2.03 **DOOR COMPONENTS**

A. **Track**: Rolled galvanized steel, 0.090 inch thick; 2 inch wide, continuous one piece per side; galvanized steel mounting brackets 1/4 inch thick.

B. **Hinge and Roller Assemblies**: Heavy duty hinges and adjustable roller holders of galvanized steel; floating hardened steel bearing rollers, located at top and bottom of each panel, each side.

C. **Standard Springs**: 10,000 cycles.

D. **Lift Mechanism**: Torsion spring on cross head shaft, with braided galvanized steel lifting cables.
   1. **For Manual Operation**: Requiring maximum exertion of 25 lbs force to open.

E. **Sill Weatherstripping**: Resilient hollow rubber strip, one piece; fitted to bottom of door, full length contact.

F. **Jamb Weatherstripping**: Roll formed steel section full height of jamb, fitted with resilient weatherstripping, placed in moderate contact with door panels.

G. **Head Weatherstripping**: EPDM rubber seal, one piece full length.

H. **Panel Joint Weatherstripping**: Neoprene foam seal, one piece full length.

I. **Lock**: Inside center mounted, adjustable keeper, spring activated latch bar with feature to retain in locked or retracted position; interior and exterior handle.

J. **Reinforcing struts**: Individual roll-formed steel hat channels.

2.04 **ELECTRICAL OPERATION**

A. **Electrical Characteristics**:
   1. 1/3 hp 15 rated load amperes; manually operable in case of power failure, transit speed of 12 inches per second.

B. **Motor**: NEMA MG1, Type 4.

C. **Wiring Terminations**: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

D. **Disconnect Switch**: Factory mount disconnect switch in control panel.

E. **Electric Operator**: Side mounted on cross head shaft, adjustable safety friction clutch; brake system actuated by independent voltage solenoid controlled by motor starter; enclosed gear driven limit switch; enclosed magnetic cross line reversing starter; mounting brackets and hardware. Equal to Overhead RSX Commercial Operator.
F. Safety Edge: At bottom of door panel, full width; electro-mechanical sensitized type, wired to stop door upon striking object; hollow neoprene covered to provide weatherstrip seal.

G. Control Station: Standard three button (open-close-stop) momentary type control for each electric operator.
   1. 24 volt circuit.
   2. Surface mounted.
   3. Locate at inside door jamb.

H. Radio Control Antenna Detector:

I. Loop Detector and Treadle:

J. Hand Held Transmitter: Digital control, resettable, two per door.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.
   B. Verify that electric power is available and of the correct characteristics.

3.02 PREPARATION
   A. Prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.
   B. Apply primer to wood frame.

3.03 INSTALLATION
   A. Install door unit assembly in accordance with manufacturer's instructions.
   B. Anchor assembly to wall construction and building framing without distortion or stress.
   C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.
   D. Fit and align door assembly including hardware.
   E. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.
   F. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07 9005.
   G. Install perimeter trim.

3.04 TOLERANCES
   A. Maximum Variation from Plumb: 1/16 inch.
   B. Maximum Variation from Level: 1/16 inch.
   C. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 ft straight edge.
   D. Maintain dimensional tolerances and alignment with adjacent work.

3.05 ADJUSTING
   A. Adjust door assembly for smooth operation and full contact with weatherstripping.
   B. Have manufacturer's field representative present to confirm proper operation and identify adjustments to door assembly for specified operation.

3.06 PROTECTION
   A. Protect installed products from damage during subsequent construction.
   B. Clean doors, frames and glazing.
   C. Remove temporary labels and visible markings.
D. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

END OF SECTION
SECTION 08 6223
TUBULAR DAYLIGHTING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Tubular skylights, consisting of skylight dome, reflective tube, and diffuser assembly; configuration as indicated on the drawings.
B. Accessories.

1.02 RELATED REQUIREMENTS
A. Section 074123 - Preformed Metal Roof Panels: Flashing-in of skylight base.

1.03 REFERENCE STANDARDS
C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
F. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2014.

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
C. Installation methods.
D. Storage and handling requirements and recommendations.
E. See Section 01 3000 - Administrative Requirements, for submittal procedures.
F. Shop Drawings: Submit shop drawings showing layout, profiles and product components, including anchorage, flashings and accessories.
G. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
   1. Evidence of AAMA Certification.
   2. Evidence of WDMA Certification.
   3. Evidence of CSA Certification.
   4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.

H. Verification Samples: As requested by the Architect.
I. Test Reports: Independent testing agency reports verifying compliance with specified performance requirements.

1.05 QUALITY ASSURANCE
A. Manufacturer Qualifications: Engaged in manufacture of tubular skylights for minimum of 10 years.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Store products in manufacturer's unopened packaging until ready for installation.
B. Store products in manufacturer's unopened packaging until ready for installation.
C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 PERFORMANCE REQUIREMENTS
A. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.08 WARRANTY
A. Daylighting Device: Manufacturer's standard warranty for 10 years.
B. Air Infiltration Test: Air infiltration will not exceed 0.30 cfm/sf aperture with a pressure delta of 1.57 psf across the tube when tested in accordance with ASTM E 283.
   1. Skylights: Manufacturer's standard warranty for 10 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS
C. Tubular Skylight Inc: www.tubular-skylight.com/#sle.
D. Velux America, Inc; VELUX TCC - Curb Mounted SUN TUNNEL Skylight: www.veluxusa.com/#sle.
E. Substitutions: See Section 01 6000 - Product Requirements.

2.02 TUBULAR SKYLIGHTS
A. Design Selection Standard - Solatube Model 750 DS-C Penetrating Ceiling, 21 inch Daylighting System.
B. Tubular Skylights: Transparent roof-mounted skylight dome and curb, reflective tube, and ceiling level diffuser assembly, transferring sunlight to interior spaces.
   1. All components made and assembled by one manufacturer.
   2. Non-Metal Parts: Flammability less than the following.
      a. Roof-Top Components: Class B when tested in accordance with ASTM E108 or UL 790.
      b. Combustibility - Light Transmitting Parts: Minimum 2.5 inches/min (ICC Class CC-2), when tested in accordance with ASTM D635.
3. Thermal Movement: Fabricate to allow for thermal movement resulting from temperature differential from minus 30 to 180 degrees F without damage to components, fasteners, or substrates.

4. Design to withstand the following loads without breakage or permanent damage to any parts, when tested in accordance with ASTM E330/E330M:

C. Performance Requirements: Provide products that comply with the following:
   1. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific tubular skylight:
      a. Positive and negative wind load of 10 psf.
      b. No permanent deflection in excess of 0.2 percent of span.
      c. Live load of 100 psf on dome with safety factor of 3.
   2. Air Infiltration: Maximum 0.10 cfm per foot of crack length at 6.24 psf pressure differential when tested in accordance with ASTM E283.
   3. Water Resistance: No uncontrolled water leakage at 6.24 psf pressure differential with water rate of 5 gallons/h/sf, when tested in accordance with ASTM E331; design to ensure that water will not accumulate inside assembly.
   4. Thermal Movement: Fabricate to allow for thermal movement resulting from temperature differential from minus 30 to 180 degrees F.

D. Roof Assemblies: Transparent, UV and impact resistant dome with flashing base supporting dome and top of tube.
   1. Glazing: Acrylic plastic, 0.125 inch minimum thickness.
   2. Low-Angled Sun Reflector: Concentric, light refracting etched lines, minimum 2 inches high, to improve light input when sun is low on horizon.
   4. Base Height: 4 inches
   5. Base Slope or Pitch: 4 in 12.
   6. Dome Ring: Attached to top of base section; 0.090 inch nominal thickness injection molded high impact ABS; to prevent thermal bridging between base flashing and tubing and channel condensed moisture out of tubing; weather seal of medium density pile weather stripping.

E. Reflective Tube: ASTM B209 (ASTM B209M) aluminum sheet, thickness between 0.015 inch and 0.020 inch.
   1. Interior Finish: Exposed interior surfaces of high reflectance specular finish; specular reflectance 92, total reflectance 95 percent.
   2. Tube Diameter: 21 inches.
   3. Angle Transition Tubes: Provide transition tube for angle adjustment at both the roof sheathing and the ceiling to allow offsetting between roof dome and ceiling diffuser within the attic.

F. Diffuser Assemblies: Supporting light transmitting surface at bottom termination of tube, with compression seal to minimize condensation and bug or dirt infiltration.
   1. Ceiling Ring: Edge trim for ceiling opening; injection molded high impact ABS.
   2. Diffuser Trim: Edge and attachment trim for diffuser lens; injection molded high impact ABS.
   3. Diffuser Shape at Solid Ceilings: Round, same diameter as tube.
   5. Lens Material: Acrylic plastic
   7. Seal: Closed cell EPDM foam rubber

2.03 ACCESSORIES

A. Fasteners: Same material as metals being fastened, non-magnetic steel, non-corrosive metal of type recommended by manufacturer, or injection molded nylon.

B. Joint Sealant: As specified in Section 07 9005.
PART 3 EXECUTION

3.01 EXAMINATION
   A. Do not begin installation until substrates have been properly prepared.
   B. If substrate preparation is the responsibility of another installer, notify JHS Architects of unsatisfactory preparation before proceeding.

3.02 PREPARATION
   A. Clean surfaces thoroughly prior to installation.
   B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION
   A. Install in accordance with manufacturer's printed instructions.
   B. Seal joints exposed to weather using procedures specified in Section 07 9005.
   C. Conduct field test for water tightness; conduct water test in presence of JHS Architects. Correct defective work and re-test until satisfactory.

3.04 PROTECTION
   A. Protect installed products until completion of project.
   B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION
SECTION 08 7100
DOOR HARDWARE

PART 1  GENERAL

1.01  SECTION INCLUDES
   A. Hardware for H.M. Doors.
   B. All Hardware stipulated or implied in Hardware Groups indicated on drawings.

1.02  RELATED REQUIREMENTS
   A. Section 08 1113 - Hollow Metal Doors and Frames.

1.03  SUBMITTALS
   A. Shop Drawings:
      1. Submit manufacturer's parts lists and templates.
   B. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions
      requiring special attention.
   C. BHMA A156.7 - American National Standard for Template Hinge Dimensions; 2014.
   D. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in
      ITD's name and registered with manufacturer.

1.04  DELIVERY, STORAGE, AND HANDLING
   A. Package hardware items individually; label and identify each package with door opening code to
      match hardware schedule.

1.05  COORDINATION
   A. Coordinate the work with other directly affected sections involving manufacture or fabrication of
      internal reinforcement for door hardware.
   B. Furnish templates for door and frame preparation.
   C. Coordinate ITD's keying requirements during the course of the Work.

1.06  WARRANTY
   A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
   B. Provide five year warranty for door closers.

1.07  MAINTENANCE PRODUCTS
   A. Provide special wrenches and tools applicable to each different or special hardware component.
   B. Provide maintenance tools and accessories supplied by hardware component manufacturer.

PART 2  PRODUCTS

2.01  MANUFACTURERS  (* INDICATES MANUFACTURER USED IN HARDWARE SCHEDULE )

2.02  GENERAL REQUIREMENTS
   A. Provide door hardware specified, or as required to make doors fully functional, compliant with
      applicable codes, and secure to the extent indicated.
   B. Provide items of a single type of the same model by the same manufacturer.
C. Provide products that comply with the following:
   1. Applicable provisions of federal, state, and local codes.

2.03 LOCKS AND LATCHES
   A. Lever Locks: Corbin - Provide a lock for every door, unless specifically indicated as not
      requiring locking.
      1. If no hardware set is indicated for a swinging door provide an office lockset.
      2. Trim: Provide lever handle or pull trim on all locks.
      3. Lock Cylinders: Provide key access on outside of all locks.
   B. Lock Cylinders: Manufacturer’s standard tumbler type, six-pin standard core.
      1. Provide cams and/or tailpieces as required for locking devices required.
   C. Keying: Key to ITD’s Master for other facilities on site.

2.04 HINGES
   A. Hinges: McKinney*
   B. Hinges: Provide hinges on every swinging door.
      1. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
      2. Provide hinges in the quantities indicated.
      3. Provide non-removable pins on exterior outswinging doors.

2.05 CLOSERS
   A. Closers: Norton*

2.06 GASKETING AND THRESHOLDS
   A. Gasketing, Thresholds and Door Bottoms: Pemko & Rockwood *
   B. Manufacturers - Gasketing and Thresholds:

2.07 GENERAL REQUIREMENTS FOR DOOR HARDWARE PRODUCTS
   A. Provide products that comply with the following:
      1. Applicable provisions of Federal, State, and local codes.
      2. ANSI/ICC A117.1, American National Standard for Accessible and Usable Buildings and
         Facilities.
   B. Finishes: Identified in schedule on drawings.

2.08 KEYING
   A. Lock Cylinders: Provide Best Lock Cylinders.

2.09 FINISHES
   A. Finishes: Identified in schedule.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that doors and frames are ready to receive work; labeled, fire-rated doors and frames are
      present and properly installed, and dimensions are as instructed by the manufacturer.

3.02 INSTALLATION
   A. Use templates provided by hardware item manufacturer.
B. Mounting heights for hardware from finished floor to center line of hardware item. As indicated in the following list; unless noted otherwise in Door Hardware Sets Schedule or on the drawings.
   1. For steel doors and frames: Comply with DHI (LOCS) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames".

3.03 ADJUSTING
   A. Adjust work under provisions of Section 01 7000 - Execution and Closeout Requirements.
   B. Adjust hardware for smooth operation.

3.04 PROTECTION
   A. Protect finished Work under provisions of Section 01 7000 - Execution and Closeout Requirements.
   B. Do not permit adjacent work to damage hardware or finish.

END OF SECTION
SECTION 09 9600
HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. High performance coatings.
B. Surface preparation.
C. Exterior Scope: Finish all exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Exposed surfaces of steel lintels and ledge angles.
   2. Steel bollards. See locations & details on architectural site plan drawings.
   3. Hollow Metal door frames and doors.
D. Interior Scope: Finish all surfaces exposed to view, unless fully factory-finished and as scheduled in Finish Schedule, including the following:
   1. Steel Bollards. See locations on plans.
   2. Plywood panels on interior walls and ceilings.
   3. Misc Metal fabrications.
   4. Hollow metal door frames and doors.

1.02 REFERENCE STANDARDS
C. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2005 (Reapproved 2012).
D. ASTM D4260 - Standard Practice for Liquid and Gelled Acid Etching of Concrete; 2005 (Reapproved 2012).
G. SSPC-SP 1 - Solvent Cleaning; 2015.
H. SSPC-SP 13 - Surface Preparation of Concrete; (Reaffirmed 2015); 2003.

1.03 SUBMITTALS
A. See Section 01 3000 - ADMINISTRATIVE REQUIREMENTS for submittal procedures.
B. Product Data: Provide complete list of all products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. Cross-reference to specified coating system(s) product is to be used in; include description of each system.
   3. Manufacturer's installation instructions.
   4. If proposal of substitutions is allowed under submittal procedures, explanation of all substitutions proposed.
C. Product Data: Provide data indicating coating materials.
D. Manufacturer's Certificate: Certify that high-performance coatings conform to VOC limits specified.
E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
F. Maintenance Data: Include cleaning procedures and repair and patching techniques.

1.04 QUALITY ASSURANCE
A. Maintain one copy of each referenced document that applies to application on site.
B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
C. Applicator Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING
A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
B. Container Label: Include manufacturer’s name, type of coating, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
C. Coating Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer’s instructions.

1.06 REGULATORY REQUIREMENTS
A. Conform to applicable code for flame and smoke rating requirements for products and finishes.
B. Lead Content: Do not use coatings having a lead content over 0.06 percent by weight of nonvolatile content.
C. Chromate Content: Do not use coatings containing zinc-chromate or strontium-chromate.
D. Asbestos Content: Materials shall not contain asbestos.
E. Mercury Content: Materials shall not contain mercury or mercury compounds.
F. Silica: Abrasive blast media shall not contain free crystalline silica.
G. Human Carcinogens: Materials shall not contain ACGIH TLV-BKLT and ACGIH TLV-DOC confirmed human carcinogens (A1) or suspected human carcinogens (A2).

1.07 FIELD CONDITIONS
A. Do not install materials when temperature is below 55 degrees F or above 90 degrees F.
B. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.
C. Provide lighting level of 60 ft candles measured mid-height at substrate surface.
D. Restrict traffic from area where coating is being applied or is curing.

1.08 EXTRA MATERIALS
A. Supply 1 gallon of each color; store where directed.
B. Label each container with color in addition to the manufacturer’s label.

1.09 WARRANTY
A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
B. Correct defective Work within a five year period after Date of Substantial Completion.
C. Warranty: Include coverage for bond to substrate.
PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide high performance coating products from the same manufacturer to the greatest extent possible.
   1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by JHS Architects is obtained using the specified procedures for substitutions.
   2. Substitution of other products by the same manufacturer is preferred over substitution of products by a different manufacturer.

B. High-Performance Coatings:
   Design Products Manufacturer: Tnemec Company as specified or equal by others below.
   6. Substitutions: Section 01 6000 - Product Requirements.

2.02 COATING SYSTEMS - EXTERIOR AND INTERIOR

A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified to include primer or filler coat and two top coats.

B. Epoxy Coating for Plywood walls and ceiling:
   1. Number of prime coat: One
      a. Prime Coat Product Characteristics:
         1) Inorganic Hybrid Water-Based Epoxy; MPI #301.
         2) Percentage of solids by volume, 100% Mixed, minimum.
   2. Number of top coats: Two.
      a. Top Coat Product Characteristics:
         1) Polyamide Epoxy; MPI #77.
         2) Percentage of solids by volume, 100% Mixed, minimum.
         3) Dry film thickness, per coat, [7 dry mils], minimum, @ Vertical Walls.
         4) Dry film thickness, per coat, [6 dry mils], minimum, @ Horizontal Ceiling.
         5) Comply with the performance requirements specified above for severe exposure.
      b. Colors: Selected from 16 standard StrataShield colors.
C. **Epoxy Coating for Interior Concrete Walls:**
   1. Number of prime coat: One
      a. Prime Coat Product Characteristics:
         1) Inorganic Hybrid Water-Based Epoxy; MPI #301.
         2) Percentage of solids by volume, 100% Mixed, minimum.
      b. *Tnemec Company, Inc. Series 1254 EPOXOBLOCK WB Primer:*
   2. Number of top coats: Two.
      a. Top Coat Product Characteristics:
         1) Ceramic-Modified Waterborne Aliphatic Polyurethane.
         2) Percentage of solids by volume, 100% Mixed, minimum.
         3) Dry film thickness, per coat, [7 dry mils], minimum, @ Vertical Walls.
         4) Dry film thickness, per coat, [6 dry mils], minimum, @ Horizontal Ceiling.
         5) Comply with the performance requirements specified above for severe exposure.

D. **Epoxy Coating for Metal Doors & Frames & Bollards:**
   1. Number of prime coat: One
      a. Prime Coat Product Characteristics:
         1) Polyamide Epoxy; MPI #101.
         2) Percentage of solids by volume, 100% Mixed, minimum.
   2. Number of top coats: Two.
      a. Top Coat Product Characteristics:
         1) Inorganic Hybrid Water-Based Epoxy; MPI #301
         2) Percentage of solids by volume, 100% Mixed, minimum.
         3) Dry film thickness, per coat, [7 dry mils], minimum, @ Vertical Walls.
         4) Dry film thickness, per coat, [6 dry mils], minimum, @ Horizontal Ceiling.
         5) Comply with the performance requirements specified above for severe exposure.
      b. *Tnemec Company, Inc. Series 233 Surfacing Epoxy:*

E. **Epoxy Coating for Exterior Concrete Containment Walls and Slab:**
   1. Number of prime coat: One
      a. Prime Coat Product Characteristics:
         1) Ceramic-Modified Waterborne Aliphatic Polyurethane.
         2) Percentage of solids by volume, 100% Mixed, minimum.
   2. Number of top coats: Two.
      a. Top Coat Product Characteristics:
         1) Polyamide Epoxy; MPI #77.
         2) Percentage of solids by volume, 100% Mixed, minimum.
         3) Dry film thickness, per coat, [7 dry mils], minimum, @ Vertical Walls.
         4) Dry film thickness, per coat, [6 dry mils], minimum, @ Horizontal Ceiling.
         5) Comply with the performance requirements specified above for severe exposure.
      b. Color: Gray
      c. *Tnemec Company, Inc. ENVIRO-Glaze Series 297:*
2.03 ACCESSORY MATERIALS
   A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of coated surfaces.
   B. Joint Tape: Provide 3" wide Fiber Glass Tape for plywood joints. (Heavy duty drywall tape)

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify existing conditions before starting work.
   B. Do not begin application of coatings until substrates have been properly prepared.
   C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.
   D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
   E. If substrate preparation is the responsibility of another installer, notify JHS Architects of unsatisfactory preparation before proceeding.
   F. Test shop-applied primer for compatibility with subsequent cover materials.
   G. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
      1. Cementitious Substrates: Do not begin application until substrate has cured 28 days minimum and measured moisture content is not greater than 12 percent.
      2. Concrete: 12 percent.
      3. Concrete Floors: 8 percent.
      4. Wood: Do not begin application if substrate has moisture content over 12 percent.
   H. Proceed with coating application only after unacceptable conditions have been corrected.
      1. Commencing coating application constitutes Contractor's acceptance of substrates and conditions.

3.02 PREPARATION
   A. Clean surfaces of loose foreign matter.
   B. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.
   C. Remove finish hardware, fixture covers, and accessories and store.
   D. Concrete:
      1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
      2. Clean surfaces with pressurized water. Use pressure range of 1500 to 4000 psi at 6 to 12 inches. Allow to dry.
      3. Clean concrete according to ASTM D4258. Allow to dry.
      4. Prepare surface as recommended by coating manufacturer and according to SSPC-SP 13.
   E. Ferrous Metal:
      1. Solvent clean according to SSPC-SP1.
   F. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.
3.03 PRIMING
A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

3.04 COATING APPLICATION
A. Apply coatings in accordance with manufacturer's written instructions, to thicknesses specified and recommendations in "MPI Architectural Painting and Specification Manual".
B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.
C. Unless otherwise specified or recommended by the paint manufacturer, paint may be applied by brush, roller, or spray. Rollers for applying paints and enamels shall be of a type designed for the coating to be applied and the surface to be coated.
D. Paints, except water-thinned types, shall be applied only to surfaces that are completely free of moisture as determined by sight or touch.
E. Thoroughly work coating materials into joints, crevices, and open spaces. Special attention shall be given to insure that all edges, corners, crevices, welds, and rivets receive a film thickness equal to that of adjacent painted surfaces.
F. Each coat of paint shall be applied so dry film shall be of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Hiding shall be complete.
G. Touch up damaged coatings before applying subsequent coats. Interior areas shall be broom clean and dust free before and during the application of coating material.
H. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
I. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
J. Apply each coat to uniform appearance.
K. Thermosetting Paints: Topcoats over thermosetting paints (epoxies and urethanes) should be applied within the overcoating window recommended by the manufacturer.
L. Floors: For nonslip surfacing on level floors, as the intermediate coat is applied, cover wet surface completely with almandite garnet, Grit No. 36, with maximum passing U.S. Standard Sieve No. 40 less than 0.5 percent. When the coating is dry, use a soft bristle broom to sweep up excess grit, which may be reused, and vacuum up remaining residue before application of the topcoat.
M. Drying Time: Allow time between coats, as recommended by the coating manufacturer, to permit thorough drying, but not to present topcoat adhesion problems. Provide each coat in specified condition to receive next coat.
N. Primers, and Intermediate Coats: Do not allow primers or intermediate coats to dry more than 30 days, or longer than recommended by manufacturer, before applying subsequent coats. Follow manufacturer's recommendations for surface preparation if primers or intermediate coats are allowed to dry longer than recommended by manufacturers of subsequent coatings. Each coat shall cover surface of preceding coat or surface completely, and there shall be a visually perceptible difference in shades of successive coats.
O. Finished Surfaces: Provide finished surfaces free from runs, drops, ridges, waves, laps, brush marks, and variations in colors.
3.05 MIXING AND THINNING OF PAINTS
   A. Reduce paints to proper consistency by adding fresh paint, except when thinning is mandatory to suit surface, temperature, weather conditions, application methods, or for the type of paint being used. Obtain written permission from the Contracting Officer to use thinners. The written permission shall include quantities and types of thinners to use.
   B. When thinning is allowed, paints shall be thinned immediately prior to application with not more than 1 pint of suitable thinner per gallon. The use of thinner shall not relieve the Contractor from obtaining complete hiding, full film thickness, or required gloss. Thinning shall not cause the paint to exceed limits on volatile organic compounds.

3.06 TWO-COMPONENT SYSTEMS
   A. Two-component systems shall be mixed in accordance with manufacturer's instructions. Any thinning of the first coat to ensure proper penetration and sealing shall be as recommended by the manufacturer for each type of substrate.

3.07 COATING SYSTEMS
   A. Minimum Dry Film Thickness (DFT): Apply paints, primers, varnishes, enamels, undercoats, and other coatings to a minimum dry film thickness of 0.038 mm (1.5 mil) each coat unless specified otherwise in the Tables. Coating thickness where specified, refers to the minimum dry film thickness.

3.08 COATING SYSTEMS FOR METAL
   A. Apply specified ferrous metal primer on the same day that surface is cleaned, to surfaces that meet all specified surface preparation requirements at time of application.
   B. Shop-primed Surfaces: Touch up exposed substrates and damaged coatings to protect from rusting prior to applying field primer.
   C. Exposed Nails, Screws, and Miscellaneous Ferrous Surfaces. On surfaces to be coated with water thinned coatings, spot prime exposed nails and other ferrous metal with latex primer.

3.09 FIELD QUALITY CONTROL
   A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.
   B. ITD will provide field inspection.
   C. Dry Film Thickness Testing: ITD will engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
      1. Touch up and restore coated surfaces damaged by testing.
      2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, and specified thickness, Contractor shall pay for retesting and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations, and specified thickness.

3.10 CLEANING
   A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
   B. Clean surfaces immediately of overspray, splatter, and excess material.
   C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.11 PROTECTION
   A. Protect finished work from damage.

END OF SECTION
SECTION 22 0501
COMMON PLUMBING REQUIREMENTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to work of this section.
B. Related Sections: Refer to "Electrical Requirements for Plumbing Equipment" Division 26 for basic electrical requirements, for all Mechanical equipment in Division 23. Special and specific electrical requirements are specified within each respective equipment specification section.

1.2 SCOPE OF WORK - GENERAL
A. This section specifies the basic requirements for plumbing installations and includes requirements common to Section 220000. It expands and supplements the requirements specified in sections of Division 01 General Requirements.
B. The work covered by the Plumbing Sections of the Specifications shall include the furnishing of all materials, labor, transportation, tools, permits, fees, inspections, utilities and incidentals necessary for the complete installation of all mechanical work required in the Contract Drawings.
C. It is the intent of the Contract Documents to provide an installation that is complete and operable in every respect. In the event that additional details or special construction is required for work indicated or specified under this section of work or work specified in other sections, it shall be the responsibility of the Contractor to provide all material and equipment which is usually furnished with such systems in order to complete the installation, whether mentioned or not.
D. The Contractor shall review all Contract Drawings (Plumbing and HVAC) and Specifications and include in his bid all work specifically as being performed in the Plumbing section. The Contractor shall be responsible for all work performed by his subcontractors.

1.3 DEFINITIONS
A. "Provide" shall mean "furnish and install complete and ready for intended use."
B. "Indicated" shall mean "indicated on drawings" and/or the intent for a complete and operable system.
C. "Concealed" shall mean "hidden from sight as in trenches, chases, furred spaces or hung ceilings."
D. "Exposed" shall mean "not concealed", as defined above.
E. "Noted" shall mean "noted on Plumbing and HVAC drawings or in specifications".
F. "Contractor" also referred to as "Plumbing Contractor" or "the Contractor", shall mean "the Plumbing Contractor".

1.4 CODES AND STANDARDS
A. All plumbing work shall be installed in strict accordance with the most current edition of the International Building Code (IBC) or International Plumbing Code, International Mechanical Code (IMC), Uniform Plumbing Code (UPC), National Fire Protection Association (NFPA), International Fire Code (IFC), National Electrical Code (NEC), Energy Code IECC and ASHRAE-90.1, and all applicable state and local codes, laws and ordinances that relate to the work to be accomplished.

1.5 PERMITS AND FEES
A. The Contractor shall obtain and pay for all required permits and fees necessary to fully complete all work included in the Contract Drawings and Specifications.
1.6 CONSTRUCTION OBSERVATIONS:
   A. During the course of construction of this project, the engineer shall visit the project site periodically on an as-needed basis. The construction observation intervals may vary depending on the progress and/or stage of construction and whether sewer, vents, water, natural gas, air, Domestic cold and hot water for drains, and overflows, condensate piping, etc., is being placed below grade and/or concealed, surface mounted items, setting of equipment, equipment connections, etc. However, written field questions are encouraged and welcomed throughout the course of construction and shall be answered promptly in writing, to keep the project construction on schedule. The project foreman should have the building plans, construction schedules, etc., affixed in mind, so the plumbing systems defined in the construction documents are to be assembled, along with the setting of equipment, of parts and pieces, related to the project are anticipated, to prevent delays or emergencies.
   B. The engineer shall make one (1) final inspection. The contractor shall notify the engineer that the installation is complete, i.e., the systems are operating and have been tested and balanced, and everything is complete and operational, all equipment connections have been made and the owner’s representatives have been trained. At this time the engineer, the contractor, and the owner’s representative shall schedule a time to walk the project for evaluation, and record in writing the items found to be incomplete. The contractor shall make the corrections within one week after this inspection. If at the conclusion of the observation tour the owner and engineer determine that additional visits are required to complete the project, the contractor shall reimburse the engineer at the rate of $600 for each site visit required, plus out of pocket expenses, until all items are acceptable to the engineer and owner. The contractor shall pay the engineer in advance of each inspection.
   C. On extra visits, the contractor shall report to the engineer that all systems are complete, and the project is ready for the owner’s acceptance.

1.7 INTENT AND INTERPRETATION
   A. The Drawings and Specifications are intended to supplement each other and any details contained in one and not the other shall be included as if contained in both. Items not specifically mentioned in the specifications or noted on the drawings, but which are obviously necessary to make a complete working installation shall be included.
   B. The drawings are partly diagrammatic and do not necessarily show the exact location of all new piping and existing utilities, unless specifically dimensioned.
   C. Riser and other diagrams are schematic only and do not necessarily show the physical arrangement of the equipment. They shall not be used for obtaining quantities or lineal runs of piping.
   D. The location of all piping shall be checked to determine that it clears all openings and structural members; that it may be properly concealed; and that it clears cabinets, lights and equipment having fixed locations.
   E. Plumbing drawings shall serve as the working drawings for this portion of the work but the Contractor shall refer to the Architectural, Structural, HVAC, and Electrical drawings for additional detail affecting the installation of his work. Architectural drawings shall take precedence over the Plumbing drawings if any dimensional discrepancies exist.
   F. The approximate location of each item is indicated on the drawings. These drawings are not intended to give complete and exact details in regard to location. Exact locations are to be determined by actual measurements at the building, and will in all cases be subject to the approval of the Architect, who reserves the right to make any reasonable changes in the locations indicated without additional cost.
   G. The contractor shall not make a change in a system, system layout, and/or equipment, except he receive written approval or drawing over the signature of the engineer.
1.8 SUBMITTAL OF EQUIPMENT FOR APPROVAL

A. Refer to the Conditions of the Contract (General and Supplementary) and Division 01 General Requirements for submittal definitions, requirements and procedures.

B. SHOP DRAWINGS AND PRODUCT DATA OF EQUIPMENT BEING INSTALLED IN THE PROJECT: After the contract is awarded, but prior to manufacture or installation of any equipment, the contractor shall assemble and submit Shop Drawings, parts lists, Brochures, etc., for the materials and equipment requiring approval for each section of this specification. A brief description of submittal conditions is given below. Refer to identified sections for detailed submittal requirements.

C. Confirming and approving substitute equipment for the project.

1. Confirm that the substitute equipment is approved for installation before entering it into the base bid. It must be defined as to name, catalog number or both in a published addendums. If not approved, do not enter in the base bid.

2. Each unit shall state the name of the equipment manufacturer (name, address, phone, email, etc.) catalog number, size, physical dimensions and weight, energy characteristics (electrical and/or fuel), operating characteristics, materials from which constructed, any special conditions that may apply to the construction of the unit, etc.

3. The equipment must explain and define in detail the components that make-up the unit, so the owner and engineer can determine, define the replaceable parts during the life of the unit.

4. Complete operating instruction, normal maintenance recommendations, start-up procedures, etc.

5. In general, the contractor shall acquaint himself with the equipment to confirm that it can be installed as shown on the plans and from his experience perform the indicated function in the system where installed.

6. In the course of reviewing the shop drawings, the Contractor shall confirm the energy usage (gas, power, air, water, drains, physical size, weight etc.) and determine if these services are available at the equipment characteristics. Namely: confirm voltage, phase, etc., with the project's electrical characteristics. Availability of fuels with the serving utility, also drains, water (hot and cold) pipe sizes, etc., or if there is discrepancies in the services. If the indicated equipment services are not available, inform the engineer by phone and in writing, also note on the shop drawing. This cooperative effort will correct a problem before the equipment arrives at the job site.

a. The shop drawings shall also indicate the scheduled delivery dates the equipment will be at the site.

b. If the contractor foresees any problems with equipment size, weight, delivery, etc., it shall be noted in writing, attached to the shop drawings.

1.9 RECORD DOCUMENTS

A. Contractor shall record differences between plumbing systems as installed and those indicated in Contract Documents on a set of prints of plumbing drawings to be furnished by Architect. Return these prints to Architect at completion of project. Notations made on drawings shall be neat and legible. Comply with Division 01 General Requirements.

1.10 OPERATION AND MAINTENANCE MANUALS

A. Contractor shall prepare and submit Operation and Maintenance Manuals for mechanical systems provided under this Contract. Comply with Division 1 requirements for procedures and requirements for preparation and submittal of manuals.

B. Manual binder shall have permanent lettering of a contrasting color. Information to be included on the binder is as follows:
C. The front cover shall be lettered as follows:

PLUMBING
OPERATION AND MAINTENANCE
MANUAL
(PROJECT NAME)
(CITY AND STATE)
(YEAR)

OWNER: (NAME)
ARCHITECT: (NAME)
PLUMBING ENGINEER: Nielson Engineering Inc.
GENERAL CONTRACTOR: (NAME)
PLUMBING CONTRACTOR: (NAME)

The spine shall be lettered as follows:

PLUMBING O & M MANUAL (Year)
(Project Name)

D. Provide a master index at beginning of Manual showing items included. Use plastic tab indexes for sections of Manual.

E. Cover section shall consist of name, address, and phone number of Project Architect, General Contractor, Mechanical Engineer, Mechanical Contractor and all Mechanical Sub-Contractors.

F. Provide a separate section for each section of the specifications. Provide index for each section listing equipment included. Include all items specified in Sections 220529 through 226313. Provide a list of each type of equipment supplied with the local supplier's name, address and phone number.

G. Include descriptive literature (manufacturer’s catalog data) of each manufactured item. Literature shall show capacities and size of equipment used and be marked indicating each specific item with applicable data underlined. Data sheets shall be original. Copies are not acceptable.

H. One (1) copy of the manual shall be submitted for review and approval by the Engineer. After approval, submit three (3) copies of manual to the Owner for approval unless otherwise directed by Division 1 requirements. Information to be included in manual:

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.

2. Manufacturer’s printed operating procedures to include start-up, break-in, routine and normal operating instructions; regulation, control, stopping shut-down, and emergency instructions; and summer and winter operating instructions.

3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.

4. Servicing instructions and lubrication charts and schedules.

5. Schematic control diagrams (as built-status) for each automatic control system. Mark correct operating setting for each control instrument on these diagrams. A second complete set of control diagrams encased in clear plastic laminate shall be furnished.
6. Valve schedule indicating the valve symbol (tag number), valve location by room number and description, valve purpose and system served, and valve size. Provide one corresponding set of full size mechanical prints (as-built status) showing these valve locations for cross-reference. A second complete set of valve schedules (8-1/2 in. x 11 in.) encased in clear plastic laminate and fitted in an aluminum holding frame shall be furnished to the Owner.

8. Test records and certifications.
9. Instruction period checklist.
10. Warranty information.

1.11 OPERATION AND MAINTENANCE INSTRUCTION AND TRAINING
A. The Contractor shall instruct the Owner’s Representative(s) in the Operation and Maintenance procedures described in the Operation and Maintenance Manual. Comply with Division 1 requirements.
B. Individuals present shall include Contractors, Subcontractors, and equipment factory representatives. These individuals shall assist in instruction and start-up.
C. Minimum instruction time shall be eight (8) hours unless otherwise specifically noted.
D. All Plumbing systems shall be properly functioning prior to instruction period.
E. Contractor shall prepare a checklist of all equipment and systems requiring instruction and maintenance for verification by the Owner’s Representative of satisfactory start-up and instruction. A copy of this checklist shall be included in the Operation and Maintenance Manual.

1.12 GUARANTEE
A. Contractor shall guarantee the satisfactory operation of all material and equipment installed under section 220000 and shall repair or replace to the satisfaction of the Owner or Architect, any defective materials, equipment, or workmanship which may show itself within one year from the date of acceptance.

1.13 CLEANING
A. The Contractor shall, at all times, keep the premises free from accumulations of waste material or rubbish.
B. At completion of the job, the Contractor shall remove all tools, scaffolding, and surplus materials.

PART 2 – PRODUCTS

2.1 GENERAL MATERIALS AND EQUIPMENT REQUIREMENTS
A. All materials, in general, shall conform to the requirements of all agencies or publications specified and described in Division 01 of the Contract Specifications.
B. Materials and equipment to be provided shall be the standard catalog products of manufacturers regularly engaged in the manufacture of products conforming to these specifications, and shall essentially duplicate materials and equipment that have been in satisfactory use at least two years.

C. All plumbing fixtures, pipes, fittings, and materials specified shall comply with the certification of ‘Buy America’ compliance for manufactured products.
2.2 SUBSTITUTIONS AND APPROVAL OF PRODUCT OPTIONS

A. Substitute equipment is encouraged if it is truly an equal to the specified items
   1. The items and/or equipment specified in the contract documents are standard manufacturers items found in suppliers catalogs, except it be indicated as special. The designer has taken time and effort to analyze, evaluate and prove to himself that the specified units will perform the function needed, wherein it is placed. This means the responsibility for the function of the specified equipment rests with the designer, who knows and understands what is to be accomplished.
   2. If a supplier and/or the contractor desire to substitute equipment in place of a specified item, he may do so, but he takes upon himself or herself the full responsibility that the substituted equipment will equal all of the performing characteristics, functions, etc., and/or exceed the performance of the specified item. The substitute equipment shall be of such a physical size and weight that it will mount in the designated location without alterations to the building and the structure will carry the load. If for any reason the substituted equipment requires alterations or modification, in any form to the building and/or the structure, the costs shall be paid by the contractor and/or those requesting the substitutions.
   3. Those interested in requesting a substitution shall submit a substitution request. The substitution request will be considered if it is at the office of the Engineer eight (8) working days prior to the day of bidding. The request shall include the following:
      a. A statement certifying that the equipment proposed is equal to that specified; that it has the same mechanical operating characteristics, compatible dimensions, weight, electrical characteristics and meets the function and intent of the equipment named in the contract documents.
      b. The specification and catalog numbers of the substituted equipment.
      c. A pictorial and specification brochure.
   4. Because of the short bidding period, (from issuance of drawing to bid date), between the substitution request and the bid date, the designer does not have adequate time to make a full evaluation of substitute equipment. Therefore, those requesting the substitution must accept full responsibility for the items being submitted for substitution (operating characteristics, physical size, weight, output, not increase the load, etc.). If at any time during the course of construction, even up into the final completion, if the designer finds the equipment does not meet the design criteria, comply with the performance, etc., those requesting the substitution and the contractor have the responsibility to remove the substituted equipment and install the specified item at their expense. There shall be no cost assessed to the owner and/or the designer and the replacement will not delay the completion of the project.

B. 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 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.

C. 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.

D. Samples may be required for non-standard or substituted items before installation during construction. Provide all samples as required.
E. No materials or apparatus may be substituted after the bid opening except where the equipment specified has been discontinued. This substitution may be made by a change order.

F. Substitute equipment shall not be bid except it is formally issued on a Project Addendum.

PART 3 – EXECUTION

3.1 COORDINATION AND WORKMANSHIP
A. The Contractor shall at all times cooperate with other trades on the job to avoid friction and delay to the progress of work. All points in dispute shall be referred to the Architect.

3.2 SUPERVISION
A. This Contractor shall have in charge of the work at all times a thoroughly competent superintendent. Comply with Division 01 requirements.

3.3 WORKMANSHIP
A. The work under the plumbing contract shall be performed by Journeyman workers skilled in the particular trade and include all work necessary to properly complete the installation in a professional manner so as to present a neat and finished appearance.

3.4 EXAMINATION OF SITE
A. The Contractor shall visit the site of the proposed work and become familiar with the conditions affecting the work. Contractor shall verify all measurements at the building before beginning work.

3.5 SITE UTILITY SERVICES
A. Where applicable, the Contractor shall make connections to existing permanent cold water service immediately so as to provide the use of this service by other trades. Comply with Division 01 and 02 requirements.

3.6 EXISTING UTILITIES AND PIPING
A. The locations of existing concealed lines and connection points have been indicated as closely as possible from available information. The Contractor shall assume that such connection points are within a 10-foot (10’) radius of the indicated locations. Where connection points are not within this radius, the Contractor shall contact the Architect for a decision before proceeding or may proceed at his own expense.

B. Existing piping (hot and cold water), vent lines, drain lines, roof drains, etc., that are found to obstruct the construction area (walls, floors and ceilings) and obstruct the removal of a wall, doorway or passageway, etc., shall be rerouted and/or relocated to clear the construction. The cost for this work shall be included as a part of the project and shall be covered in the contractor’s base bid.

C. If systems of other trades or exhaust ducts fall within or obstruct construction area for whatever reason, the contractor shall relocate these items to allow construction to proceed. The cost for this work shall be included as a part of the base bid.

D. Existing extensions: piping (water, drain, vent, air, etc.), etc., that are noted to be extended and/or retrofit (for whatever reason) to accommodate added and/or new areas or facilities shall accomplish the intent for which the system was designed. When complete, the system and/or systems shall function as if they were new. This work shall be included in the base bid for the project.

E. Cut, remove and legally dispose of selected plumbing equipment, components, and materials as indicated, including, but not limited to removal of plumbing piping, plumbing fixtures and trim, and other plumbing items made obsolete by the new work.

Note: The specifications identify each system herein mentioned and the extension and additions shall adhere to the specifications defined for this phase of construction.
3.7 LAYING OUT WORK
A. Locations of all equipment shown on the drawings, is approximate unless dimensioned. Exact locations of such items shall be determined by the Architect's representative and/or secured from special details and drawings. Verify the physical dimensions of each item of plumbing equipment to fit the available space and promptly notify the Architect/Engineer prior to roughing-in if conflicts appear. Coordination of equipment to the available space and to the access routes through the construction shall be the Contractor's responsibility.
B. The contractor shall hand deliver to the general contractor a written statement and/or a manufacturer's brochure on the equipment being installed at each location. The information shall give the dimensions and weight (loads) of each unit being installed. The general contractor shall forward a copy of this information to the structural engineer and obtain from him confirmation that the building structure will accommodate the loads. If there be any problem the questioning party shall notify the mechanical engineer by phone and in writing.

3.8 CONTRACTOR COORDINATION
A. In the course of installing the systems defined in the contract documents, the contractor shall closely follow the plans, details and specifications (contract documents). The system design has been a careful and laborious undertaking, with the intent purpose of producing a system and/or systems that will serve the owner well with a minimum of maintenance. Thence, the contractor shall adhere as closely as possible to the plans, details and specifications for each system. Questions and suggestions are encouraged as the project is being assembled. If for any reason, the contractor feels to deviate from the defined information, and finds a way, to improve the system, to make the system more easily assembled, make it operate more efficiently, etc., the contractor shall suggest the change to the engineer. Systems are designed to perform a specific function; the most minute change in assembly may change the function. If the engineer agrees with the change he will authorize the contractor to proceed. Contractor cooperation and coordination is appreciated. If the contractor proceeds on construction without the designer's authorization, it shall be reworked, in accordance to plans and specifications, which work shall be at the contractor's expense.
B. The contractor shall coordinate his construction. These systems, location of equipment, connections of services, etc. with the architectural, HVAC sector 230000, electrical 260000 documents throughout the course of construction. If problems are unsolvable contact the design engineer.

3.9 CUTTING AND PATCHING
A. All cutting and patching of new or existing construction required for installation of Plumbing systems and equipment specified in Section 220000 shall be the responsibility of the Plumbing Contractor unless otherwise noted. Comply with Division 01 for general requirements for cutting and patching.
B. All cutting shall be performed with masonry saws, core drills or similar equipment to provide neat and uniform openings.
C. All patching shall match adjacent surfaces in materials and finish. Do not endanger or damage installed work through procedures and processes of cutting and patching.
D. Arrange for repairs required to restore other work, because of damage caused as a result of plumbing installations.
E. No additional compensation will be authorized for cutting and patching work that is necessitated by ill-timed, defective, or non-conforming installations.
F. Perform cutting, fitting, and patching of plumbing equipment and materials required to:
   1. Uncover work to provide for installation of ill-timed work.
   2. Remove and replace defective work.
   3. Remove and replace work not conforming to requirements of the Contract Documents.
   4. Remove samples of installed work as specified for testing.
5. Install equipment and materials in existing structures.

G. Upon written instructions from the Architect/Engineer, uncover and restore work to provide for Architect/Engineer observation of concealed work.

H. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

I. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

3.10 EXCAVATION AND BACKFILL

A. Contractor shall provide all necessary excavation, shoring, and backfilling required for proper installation of plumbing work inside and outside the building. During excavation, material satisfactory for backfilling shall be stockpiled in an orderly manner at a distance from the banks of the trench equal to 1/2 the depth of the excavation, but in no instance closer than 2 feet. Excavated material not required or not satisfactory for backfill shall be removed from the site and shall be disposed of in designated areas approved for surplus material storage. Grading shall be done as necessary to prevent surface water from flowing into the excavation, and any water accumulating therein shall be removed so that the stability of the bottom and sides of the excavation is maintained.

B. Trenches shall be excavated to depth indicated or required to establish indicated slope and invert elevations and to support bottom of piping or conduit on undisturbed soil. Trenches shall be of uniform width, sufficient to provide ample working room and a minimum of 6 to 9 inches of clearance on both sides of pipe or conduit.

C. The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. Stones of 3 inches or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, shall be removed to avoid point bearing. Where unyielding material is encountered in the bottom of the trench, such material shall be removed 6 inches below the required grade and replaced with materials described below for bedding.

D. Excavation for manholes, catch basins, inlets, or similar structures shall be sufficient to leave at least 12 inches clear between the outer structure surfaces and the face of the excavation or support members. When concrete or masonry is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

E. Bedding material shall be clean, sand-gravel mixture free from organic matter and conforming to the following gradation when tested in accordance with ASTM D 422.

<table>
<thead>
<tr>
<th>U.S. Percent Passing</th>
<th>Sieve Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard 1-Inch</td>
<td>100</td>
</tr>
<tr>
<td>No. 4</td>
<td>25-80</td>
</tr>
<tr>
<td>No. 200</td>
<td>0-10</td>
</tr>
</tbody>
</table>

F. Bedding material shall be placed to a depth of 6 inches (6") over the top of piping. The bedding shall be brought up evenly on both sides of the pipe for the full length of the pipe.

G. Backfill for the remainder of the trench shall be satisfactory soil materials complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP.

H. Backfill soil materials shall be free of clay, rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.
I. Backfill to the required grade shall be placed in lifts not exceeding 6 inches loose thickness for compaction with hand operated machine compactors, and 8 inches loose thickness for other than hand operated machines otherwise specified. Each layer shall be compacted to density 105% of the adjacent soil density or as stated in the soil compaction section of these documents.

J. No underground lines shall be covered until the installation has been approved by the inspector having jurisdiction and the Owner's Representative.

K. Provide 4 inch thick concrete base slab support for piping less than 2' - 6" below surface of roadways. After installation and testing of piping, provide minimum 4 inch thick encasements (sides and top) of concrete prior to backfilling or placement of roadway subbase.

L. Bracing and shoring shall be provided where depth of excavation or character of ground render it necessary for personnel protection. Shoring shall be constructed of heavy timber planking with timber supports and shall conform with local and state safety laws and regulations.

M. Removal of bracing and shoring materials shall be done before backfilling except where necessary to insure against caving; in which case, it shall be withdrawn while backfilling is being done.

N. Provide barricades around all excavation. Barricades to be securely constructed.

O. The Contractor shall exercise extreme care while excavating in the area of utilities, carefully check for location of all possible utilities, whether shown on the drawings or not, and establish the location of all cutoff valves for ready shut-off of service in case of emergency. The Contractor shall be completely responsible for all damage to any utilities caused in excavating as well as damage to personnel and property caused by said damaged utilities whether shown on the drawings or not.

3.11 REPLACEMENT OF PAVING AND CONCRETE
A. All existing or new sidewalks, concrete paving, curbs, or asphalt paving removed or damaged by this Contractor during the period of the installation or as a result thereof, shall be replaced with like material in a manner as directed by and to the satisfaction of the Owner's Representative. Comply with Division 02 General Requirements.

3.12 OPENINGS IN PIPES
A. All temporary openings in pipes shall be capped or sealed during construction. Caps shall be removed for final connections.

3.13 PROTECTION OF MATERIALS AND EQUIPMENT
A. Contractor shall be held responsible for any and all materials and equipment to be installed under this contract and will be required to make good at his own cost any injury or damage which materials or equipment may sustain from any source or cause whatsoever before final acceptance. Comply with Division 1 requirements.

3.14 DELIVERY, STORAGE, AND HANDLING
A. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage, and handling.

B. Store equipment and materials at the site, unless off-site storage is authorized in writing. Protect stored equipment and materials from damage.

C. Coordinate deliveries of plumbing materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and efficient flow of installations.

3.15 ACCESSIBILITY
A. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing.
B. Access doors or hatches required for servicing of mechanical equipment shall be furnished and installed as specified in the other Sections of the Specifications.

3.16  **PAINTING**

A. The contractor shall paint all natural gas lines exposed to the elements with 2 coats, one coat of primer and one coat of paint, yellow oil base enamel and likewise all other piping as indicated.

B. Contractor shall touch-up scratched or damaged factory finishes of Plumbing equipment. Comply with Division 01 requirements.

C. Unless otherwise noted, all other painting of plumbing related items shall be according to Section 09900 "PAINTING".

3.17  **LUBRICATION**

A. Contractor shall properly lubricate all pieces of equipment before turning the building over to the Owner. Comply with Division 01 requirements.

3.18  **FINAL CLEANING**

A. Refer to Division 1 for general requirements for final cleaning.

B. At time of final cleanup, all fixtures and equipment shall be thoroughly cleaned and left in condition for use. All stickers, tags, shipping labels, and Manufacturers labels shall be removed.

3.19  **FIRE PENETRATION SEALS**

A. All penetrations through fire rated floors and walls shall be sealed to prevent the spread of smoke, fire, toxic gas or water through the penetration either before, during or after a fire. The fire rating of the penetration seal shall be at least that of the floor to wall into which it is installed so that the original fire rating of the floor or wall is maintained.

B. The sealant shall remain soft and pliable to allow for the removal and/or addition of piping without the necessity of drilling holes. It shall adhere to itself to allow any and all repairs to be made with the same material. It shall permit the vibration, expansion and/or contraction of piping and ducts going through the penetration without the seal cracking or crumbling.

C. When damming materials are to be left in place after the seal is complete, all such materials shall be non-flammable.

D. When sealant is injected into a penetration, the foam shall expand to surround all items within the penetration and maintain pressure against the walls of the penetration. Excess foam shall be removed. The foam shall cure within five minutes and be fire resistant at that time. No heat shall be required to further expand the foam to block the passage of fire and smoke or water.

E. All wall or floor penetration openings shall be as small as possible.

F. The foam sealant shall meet all of the fire test and hose stream test requirements of ASTM E119-73 and shall be UL classified as a Wall Opening Protective Device. the sealant shall be CHASE-FOAM, CTC PR-855 Fire Resistant Foam Sealant from Chase Technology Corporation, Huntington Station, New York 11746 or 3M Brand Fire Barrier caulk CP25, putty 303, wrap/strip FS 195 or sheet CS 195 from 3M Products Divisions, 224-4N 3M Center, St. Paul, MN 55144-1000.

3.20  **TESTING, ADJUSTING, AND BALANCING**

A. The plumbing systems shall be pressure tested in strict accordance with local and state codes by Journeyman with five plumber’s years’ experience in pressure testing. The report shall be stamped by a licensed certified plumber. The Balancing water flows in and to all equipment shall be instruments for making tests and performing work. The Plumbing Contractor shall include in his base bid all costs for tests and Balancing.

B. Testing of piping systems shall not be made until the code conditions are satisfied.

C. All instruments used for measurements shall be accurate and calibration histories for each instrument shall be available for examination. The Mechanical Engineer has the right to request instrument recalibration, or the use of other instruments, where accuracy of readings is questionable.
D. Furnish in the report a written guarantee to be effective for one year from the date of acceptance, to make any and all adjustments required to maintain comfort in all rooms and areas.

E. Reports
   1. Upon completion of testing, adjusting and balancing of the water systems, prepare a complete and legible draft report. Submit two (2) copies of the draft report to the Plumbing Design Engineer for review.
   2. Upon verification and approval of the draft reports, prepare final reports. Four (4) typewritten, organized and formatted copies of the final report are required. Furnish one (1) copy to the Mechanical Design Engineer for his record, and the remaining three (3) copies are to be included in the Owner's Operation and Maintenance Manuals.

FINAL CLEANING

END OF SECTION
SECTION 22 0529
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. General conditions section 01 and Section 220501 apply to this section.
B. Types of pipe and fittings as specified under each section.

1.2 SUMMARY
A. Included but not limited to
1. All domestic water lines (hot, cold, return, service, etc.) being installed under the contract documents. Gas piping soil, waste and vent condensate.

1.3 QUALITY INSURANCE
A. Rigid pipe hangers shall carry 5 times the load. See details on the plans.

1.4 PRODUCTS
A. Adjustable, malleable iron device type of a diameter adequate to support the pipe size see schedules below.

PART 2 – PRODUCTS

2.1 MANUFACTURED UNITS
A. Hangers, Rods and Inserts:
1. Black or Iron Galvanized or UL approved for service intended.
2. Hangers and accessories shall be Grinnell numbers specified or equals by B-Line.
   a. Support horizontal piping from clevis hangers or on roller assemblies with channel supports, except where trapeze type hangers are explicitly shown on drawings. Hangers shall have double nuts.
   b. Support insulated pipes with clevis hanger equal to Grinnell Fig 260 or roller assembly equal to Grinnell Fig 171 with an insulation protection shield equal to Grinnell Fig 167. Gauge and length of shield shall be according to Grinnell design data.
   c. Support uninsulated copper pipe from Grinnell Fig CT-65 copper plated hangers and clevis hanger equal to CT-65 is Clevis Hanger, CT-97 Adjustable Ring.

<table>
<thead>
<tr>
<th>Rod Diameter</th>
<th>Pipe Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8inch</td>
<td>2 inches and smaller</td>
</tr>
<tr>
<td>1/2inch</td>
<td>2-1/2 to 3-1/2 inches</td>
</tr>
<tr>
<td>5/8inch</td>
<td>4 to 5 inches</td>
</tr>
<tr>
<td>3/4inch</td>
<td>6 inches</td>
</tr>
<tr>
<td>7/8inch</td>
<td>8 to 12 inches</td>
</tr>
</tbody>
</table>
4. Support rods for multiple pipe supported on steel angle trapeze hangers:

<table>
<thead>
<tr>
<th>Rods</th>
<th>Number of Pipes Carried, of Sizes Listed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diameter</td>
</tr>
<tr>
<td>2</td>
<td>3/8 Inch</td>
</tr>
<tr>
<td>2</td>
<td>½ Inch</td>
</tr>
<tr>
<td>2</td>
<td>5/8 Inch</td>
</tr>
<tr>
<td>2</td>
<td>3/4 Inch</td>
</tr>
<tr>
<td>2</td>
<td>7/8 Inch</td>
</tr>
</tbody>
</table>

5. Size trapeze angles so bending stress is less than 10,000 psi.
6. Riser clamps for vertical piping: Grinnell Figure 261.
7. Concrete inserts
   a. Grinnell Figure 282
   b. Suitable for special nuts size 3/8 inch through 7/8 inch with yoke to receive concrete reinforcing rods, and with malleable iron lugs for attaching to forms.
   c. Continuous inserts shall be Unistrut P-3200 series.
8. Steel deck bracket: Unistrut P1000 with clamp nut, 6 inch length minimum.

2.2 MANUFACTURERS

A. Contact Information
1. B-Line Systems, Highland, IL www.blind.com
2. EPCO Products Inc, Fort Wayne, IN www.epcoproducts.com
4. Grinnell Corp, Lansdale, PA www.grinnell.com
5. Michigan Hanger Company, Niles, OH (800) 333-0852 or (330) 544-4700.
7. Victaulic Company of America, Easton, PA or Victaulic Company of Canada, Rexdale, ON www.victaulic.com

END OF SECTION
SECTION 22 0548
VIBRATION SUPPORTS AND SEISMIC RESTRAINTS FOR PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. General Conditions Division 01 and Section 220501 apply to this section.
B. Section 033000 Cast-In-Place Concrete
C. Furnishing and installing of seismic restraint and vibration isolation systems is by installer of equipment requiring such systems. Manufacturers of equipment specified for seismic restraint equipment requiring such systems. Manufacturers of equipment dimensions, dimensioned anchor points, operating weight, and center of gravity dimension.

1.2 SUMMARY
A. Includes but not limited to
1. Quality of and requirements for anchorage and seismic restraint systems and vibration isolation systems for plumbing piping and equipment.

1.3 REFERENCES
A. American Society for Testing and Materials
1. ASTM A 615-04b, ‘Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement’.
B. Sheet Metal and Air Conditioning Contractors National Association/American National Standards Institute.

1.4 SUBMITTALS
A. Product Data
1. Restraint system and anchorage method to be used for each piece of equipment.
2. Seismic restraints and calculations for all flexible mounted equipment.
3. Vibration isolators and flexible couplings.
4. Clearly outlined procedures for installing and adjusting isolators, seismic bracing anchors, and snubbers.

B. Shop Drawings
1. Show size, hanger length, and location of seismic restraints for piping and ductwork.
2. Show details for each isolator and seismic brace with snubbers proposed for specified equipment.
3. Show details for proposed structural steel frames and rails and for anchors to be used in conjunction with isolation of equipment.
4. Show locations of piping and ductwork restraints on installation and fabrication floor plans (not bid set of documents of floor plans), noting size and type of restraint to be used.
5. Show details of supports, hangers, anchorage, and bracing for isolated equipment as designed or proposed by professional engineer employed by a Restraint Manufacturer and qualified with seismic experience in bracing for mechanical equipment. Shop drawings submitted for seismic bracing and anchors shall bear engineer’s signed professional seal.
6. Include anchor bolt calculations, signed and stamped by registered engineer, showing adequacy of bolt sizing and type.
   a. Calculations shall include anchor embedment, minimum edge distance and minimum center distance.
   b. Design lateral forces shall be distributed in proportion to mass distribution of equipment.
   c. Furnish calculations for anchors on restraint devices, cable, isolators, and on rigidly mounted equipment.
1.5 QUALITY ASSURANCE

A. Regulatory Requirements: System design and installation shall meet seismic requirements as defined in 2009 Edition of International Building Code, Section 1621 and applicable state and local codes in accordance with the state’s Seismic Zone and with the minimum restraint capability of [0.33] or [0.5] g. Explicit requirements and details can be found in referenced SMACNA Manual.

B. Seismic Requirements: Plumbing equipment and piping shall be braced, snubbed, or supported to withstand seismic disturbances and remain operational.

C. Vibration Isolation Requirements: Isolate equipment from structure by means of resilient vibration and noise isolators.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Isolation and Seismic Equipment:
   2. Equipment with Fixed Anchor or Support:
      a. Restraint designed according to Sections 1621 and 1622 of International Building Code.
      b. Horizontal force factor for elements of structures:
         1) In addition, vertical force restraint requirement shall be computed at 1/2 value of horizontal forces.
         2) Restrain equipment not anchored directly to floors by cable system designed and furnished by Restraint Manufacturer.

B. Vibration Isolation Requirements:
   1. Design and install isolation equipment, hangers, connections, and other isolating devices to prevent transmission of vibration to structure from equipment and associated piping.
   2. For floor-mounted equipment, use recommendations of ASHRE 2003 Table 45.
   3. For roofs and floors constructed with open web joints, thin long span slabs, wooden construction and unusual light weight construction, evaluate equipment weighing more than 300 pounds to determine additional deflection of structure caused by equipment weight. Isolator deflection shall be 15 times additional deflection or deflection shown in Table 45, whichever is greater.
   4. Under-Equipment Spring Isolators:
      a. Equal to Mason SSSLHF earthquake motion restrained spring mounts with freestanding stable steel springs, leveling bolts, corrosion resistant finish, motion limiting design, uplift restraining bolts, and 1/4 inch ribbed neoprene noise stop pad.
      b. Isolators shall accept force in any direction up to 1.0g without failure, and shall limit movement to 3/4 inch in any direction.
      c. Springs shall have 50 percent overload capacity.
      d. Size as required to achieve specified static deflection.
      e. Outer diameter of spring proper shall not be less than 0.8 of spring height when in loaded position.
   5. Overhead Support Spring and Rubber Hangers:
      a. Combination spring and neoprene hangers.
      b. Hanger bracket shall have 500 percent overload capability and shall allow up to 15 degree hanger rod misalignment without short-circuiting.
      c. Springs shall have 50 percent overload capacity.
      d. Provide seismic bracing as required.
   6. Isolate piping in mechanical equipment rooms and piping three supports away or 50 feet from other mechanical equipment, whichever is greater, form structure by means of vibration and noise isolators.
      a. Isolate suspended piping with combination spring and fiberglass hangers in supporting rods.
      b. Support floor-mounted piping directly on spring mounts.
7. Isolate vertical pipe risers from structure using vibration and noise isolating expansion hangers having minimum rated deflection of four times anticipated pipe movement. Enclose in housing for fail-safe equipment.
8. Incorporate flexible connectors in piping adjacent to reciprocating equipment.
9. Elastomeric Isolator: Neoprene or high quality synthetic rubber with anti-ozone and anti-oxidant additives.
11. Isolators Exposed to Weather: Cadmium plated and neoprene coated springs.

C. Seismic restraint equipment and resilient isolation devices shall be designed and furnished by single Manufacturer.

D. Type One Acceptable Manufacturers:
4. Equal as approved by Architect before bidding. See Section 01 6000.

2.2 FINISHES
A. Clean and paint steel components. Thoroughly clean structural steel bases of welding slag and prime with zinc-chromate or metal etching primer. Etch and paint hot dipped galvanized steel components.

PART 3 - EXECUTION

3.1 INSTALLATION
A. Isolation Equipment:
1. Mount vibration isolated equipment on rigid steel frames or concrete bases unless Equipment Manufacturer certifies direct attachment capability.
2. Install snubbers with factory set clearances.
3. Piping:
   a. Protect isolated and non-isolated piping 2 ½ inches inside diameter and larger in all planes by restraints to accommodate thermal movement as well as restrain seismic motions.
   b. Locations shall be as scheduled and include, but not be limited to:
      1) At drops to equipment and at flexible connections.
      2) At 45 degree or greater changes in direction of pipe.
      3) At horizontal runs of pipe 30 feet maximum on center spacing.
      4) Gas piping shall have additional restraints as scheduled.
B. Vibration Isolation: Install piping to prevent transmission of noise and vibration into structure.

END OF SECTION
SECTION 22 0553
IDENTIFICATION FOR PLUMBING PIPES AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. General conditions Division 01 and section 220501 apply to this section.

1.2 SUMMARY
   A. Includes But Not Limited To
      1. Furnish and install identification of equipment and piping as described in Contract Documents.

PART 2 - PRODUCTS

2.1 PAINT
   A. Benjamin Moore Impervo or equivalent by Paint Manufacturer approved in Architectural Painting Sections.
   B. Use appropriate primer.

2.2 LABELS
   A. 1/8” Laminated Black Formica with white reveal on engraving. Value tags, brass with black lettering.
   B. 1 ½” Brass valve tags with black lettered numbers.

PART 3 - EXECUTION

3.1 APPLICATION
   A. Stenciling
      1. Locate identifying legends and directional arrows at following points on each piping system
         a. Adjacent to each item of equipment and special fitting.
         b. At point of entry and exit where piping goes through wall.
         c. On each riser and junction.
         d. Every 50 feet on long continuous lines.
      2. Domestic Hot & Cold Water Piping Identification
         a. Identify domestic hot and cold water piping above and below ceilings with stenciled letters “HW” and “CW” respectively.
         b. Letters shall be one inch high. Provide “Direction of Flow” arrow at each stencil.
         c. Paint color shall be as specified below.
   B. Painting: All pipe painting shall be provided for by the installing contractor i.e.: plumbing by the Plumbing Contractor.
      1. All piping in Mechanical room shall be painted.
      2. Paint natural gas piping outside the mechanical room.
      3. All piping label, inside and outside mechanical room.
C. Identification shall comply with, but not limited to the following:

**PIPE PAINTING AND LABELING LEGEND**

<table>
<thead>
<tr>
<th>SERVICE &amp; LABEL</th>
<th>SYMBOL</th>
<th>LABEL COLOR</th>
<th>LETTER</th>
<th>PIPE COLOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic Cold Water</td>
<td>DCW</td>
<td>GREEN</td>
<td>WHITE</td>
<td>DARK ROYAL BLUE</td>
</tr>
<tr>
<td>Domestic Hot Water Dom.</td>
<td>DHW</td>
<td>YELLOW</td>
<td>BLACK</td>
<td>MAGENTA</td>
</tr>
<tr>
<td>Hot Water Return Soft</td>
<td>DHWR</td>
<td>YELLOW</td>
<td>BLACK</td>
<td>MAGENTA</td>
</tr>
<tr>
<td>Cold Water</td>
<td>DSW</td>
<td>GREEN</td>
<td>WHITE</td>
<td>DARK ROYAL BLUE</td>
</tr>
<tr>
<td>Rain Water</td>
<td>RW</td>
<td>GREEN</td>
<td>WHITE</td>
<td>BROWN</td>
</tr>
<tr>
<td>Sanitary Sewer</td>
<td>SAN</td>
<td>GREEN</td>
<td>WHITE</td>
<td>BROWN</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>G</td>
<td>YELLOW</td>
<td>BLACK</td>
<td>DARK GREEN</td>
</tr>
</tbody>
</table>

** Exposed piping in mechanical rooms, boiler rooms, etc., shall be painted color indicated on chart.

D. SIZE OF LETTERS AND LENGTH OF FIELD

<table>
<thead>
<tr>
<th>OD OF PIPE OR COVERING</th>
<th>SIZE OF LETTERS</th>
<th>LENGTH OF COLOR FIELD</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4 TO 1-1/2&quot;</td>
<td>1/2&quot;</td>
<td>8&quot;</td>
</tr>
<tr>
<td>1-1/2&quot; TO 2&quot;</td>
<td>3/4&quot;</td>
<td>8&quot;</td>
</tr>
<tr>
<td>2-1/2 TO 6&quot;</td>
<td>1-1/4&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>8 TO 10&quot;</td>
<td>2-1/2&quot;</td>
<td>24&quot;</td>
</tr>
<tr>
<td>OVER 10&quot;</td>
<td>3-1/2&quot;</td>
<td>32&quot;</td>
</tr>
</tbody>
</table>

E. Paint Specification: All surfaces to be painted shall be prepared in accordance with the detailed painting specifications in the Painting Section of these specifications. Surfaces that are not subjected to temperatures higher than 212 deg. F shall be painted as specified for the area in which they are located. Pipes, valves or other equipment subjected to temperature above 212 deg. F, shall be painted with heat resisting black enamel or heat resisting aluminum paint as specified below. The Owner's Representative shall designate surfaces to be painted aluminum painted at least three coats. Colors shall be selected by Owner's Representative.

F. Heat resisting black enamel shall be Sta-Black as manufactured by Pratt and Lambert Co., or Ebonite Boiler and Stack Paint as manufactured by W.P. Fuller Co. or approved equal suitable for use at temperatures of at least 45°F.

**END OF SECTION**
SECTION 22 0719
PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. General conditions Division 01 and Section 220501 apply to this section.

1.2 SUMMARY
A. Includes But Not Limited To
   1. Furnish and install insulation on:
      a. Above ground hot water, hot water return and cold water lines, fittings, valves, and
         accessories as described in Contract Documents.
      b. Underground piping
      c. Roof drain piping, water piping and fittings.
      d. Overflow drain and condensate piping and fittings.
   B. Related Sections
      1. General Conditions, Division 01, that apply to this Section.

PART 2 - PRODUCTS

2.1 INSULATION
A. On domestic water (Above grade):
   Cold Water  \( \frac{1}{2} \)" - 2"  ½" Thick
   2" - Greater  1" Thick
   Hot Water  \( \frac{1}{2} \)" - 1"
   1 1/4" - 2"  1 ½" Thick
   2" - Greater  2" Thick
   Roof & Overflow  2" - 4"  1" Thick
   5" - 7"  1" Thick
   With factory vapor jacket.
   B. Below grade joints shall be sealed with category four products \( \frac{1}{2} \)" thick for 1" to 2" pipe and 1"
      for 2" and larger snap-on closed cell polyolefin or elastomeric pipe insulation.
      1. Armacell 5200
      2. Rubatex R373
      3. Armstrong Armaflex
   C. Approved Manufacturers
      1. Manville
      2. Owens-Corning
      3. Knauf
      4. IMCOA "ImcoLock"
      5. Armstrong "Armaflex"

2.2 PVC FITTING, VALVE, & ACCESSORY COVERS
   A. Approved Manufacturers
      1. Knauf
      2. Zeston

PART 3 - EXECUTION

3.1 APPLICATION
A. Piping
   1. The insulation must be continuous, even through supports (at supports install a split PVC
      pipe to cover insulation then clamp the split PVC to the support).
   2. Apply insulation to clean, dry piping with joints tightly butted.
   3. Adhere "factory applied vapor barrier jacket lap" smoothly and securely at longitudinal
      laps with a white vapor barrier adhesive.
4. Adhere 3 inch wide self-sealing butt joint strips over end joints.
5. All joints and insulation ends shall be sealed in accordance with the manufacturers and industry practices.

B. Fittings, Valves, & Accessories
1. Insulate with same type and thickness of insulation as pipe, with ends of insulation tucked snugly into throat of fitting and edges adjacent to pipe insulation tufted and tucked in.
2. Cover insulation with one piece fitting cover secured by stapling or taping ends to adjacent pipe covering.
3. Alternate Method
   a. Insulate fittings, valves, and accessories with one inch of insulating cement and vapor seal with two 1/8 inch wet coats of vapor barrier mastic reinforced with glass fabric extending 2 inches onto adjacent insulation.

C. Pipe Hangers
1. Do not allow pipes to come in contact with the support hangers.
2. Provide 16 ga x 6 inch long galvanized or PVC split shield over the insulation at each pipe hanger to protect pipe insulation from crushing by clevis hanger.

D. No insulation shall be applied until piping has been pressure tested and approved.

E. In Cold Attic Situations:
1. In all cold attic situations where the building insulation is located at the ceiling, all piping installed in the ceiling to roof space shall be insulated as specified herein.
2. In addition, install at 6" thick by 30" wide fiberglass blanket with vapor barrier (vapor barrier towards warm side of cavity) over the pipe to tent and allow heat loss through the ceiling to prevent the pipe from freezing. The insulation blanket shall be held in place by rolling it on a wood lathe and nailed to the joist. The building insulation shall then be applied over this pipe protection insulation.

F. Underground insulation shall be covered by slipping the insulation onto the pipe and sealing the butt joints. If slip-on is not possible, cut the insulation, install, then seal the seams and joints.
1. Insulation
   a. ½" thick Armaflex standard pipe insulation.
   b. Equals by Rubatex or IMCOA “Imcolock”
   c. All joints shall be sealed with Armstrong 520

G. In room installations where excess moisture or humidity will be present or when insulation is exposed in occupied spaces (from finished floor level to 10'-0" or ceiling height) (examples: kitchen, water lines, gym roof drain line, science rooms, stairways, hallways, etc.), provide and install a PVC or Aluminum pipe covering over fiberglass pipe insulation and seal this covering.

END OF SECTION
SECTION 22 0800
COMMISSIONING OF PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. General conditions Division 01 and Section 220501 apply to this section.

1.2 SUMMARY
A. Before the Plumbing Contractor Commissions the system he shall confirm the systems has been installed as shown and detailed on the plans; that all fittings are in place and installed as recommended by the manufacturer. He shall also confirm that the piping has been anchored as per the contract documents, and that all code conditions have been met. He shall also know that:
   1. All pressure lines shall be complete, supported, insulated and code tested and approved.
   2. All Waste and Vent lines are secured in place and have been code tested and approved.
   3. All server lines, drains, clean-outs, etc. are complete and likewise have been tested as per code.
   4. The test reports shall have been submitted to the architect/engineer over the signature of the inspecting authority.
   5. The specified insulation shall have been installed in accordance with the contract documents, manufacturer’s recommendations and industry practices.
   6. All piping shall have been cleaned of foreign debris, the domestic water lines sterilized in accordance with the specifications and current regulations have been adhered to.
   7. The plumbing contractor, shall by his own admission, indicate the project is complete, charged for operation and ready for use.
   8. Where equipment testing and/or start-up is indicated to be by a factory representative, this shall be completed. Report time of factory testing to the engineer 10-days prior to the test that he might be present.

PART 2 - TRAINING

2.1 The owner’s representative and/or representatives shall be trained on the use and operation of each system.
A. This shall not only include operation of each system, but include routine and annual maintenance required to extend the system longevity.
   1. Replacement of seals, gaskets, etc.
   2. Cleaning of filters, strainers, etc.
   3. Anticipate life of regulators, seats, etc.

END OF SECTION
SECTION 22 0900
INSTRUMENTATION AND CONTROL OF PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. General conditions Division 01 and Section 220501 apply to this section.

1.2 SUMMARY
   A. The contractor shall provide and install all of the regulations, controls, etc. as not in the contract documents.
   B. The contractor shall provide and install a liquid filled or dry as stated on drawings, pressure gauge upstream and downstream from the pressure regulator and at other locations as noted on the plans. These gauges shall be installed in the system with shut-off valves so they may be removed from the system without a system shut down. The dial size shall be listed on drawings.

1.3 TYPES OF GAUGES
   A. The gauges shall be as manufactured by
      1. Trerice
      2. Ashcraft
      3. Swagelok
      4. Weiss

1.4 EXECUTION
   A. The regulators and controls shall be installed in strict accordance with the manufacturers’ recommendations.
   B. Each gauge shall be installed not more than 3-inches from the main line and shall have a ball type shut-off valve to isolate it from the line being tested.

END OF SECTION
SECTION 22 1116
DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. General Conditions, Division 01, and Sections 220501, 230000 and 260000 as they apply to this Section.
B. Section 221116 Domestic water piping from a point 5 feet outside the building unless noted to the service main.
C. Section 220501-3.1 Criteria for performance of excavation and backfill.

1.2 SUMMARY
A. Includes But Not Limited To
1. Furnish and install culinary water piping complete with necessary valves, connections, and accessories inside building and connect with outside utility lines 5 feet from building perimeter.
2. Perform excavating and backfilling compactors required by work of this Section.

1.3 SUBMITTALS
A. Quality Control
1. Submit written report of sterilization test to Architect.

PART 2 - PRODUCTS

2.1 MANUFACTURING
A. All pipe and fittings shall be domestic (USA) manufactured.
B. All valves shall be domestic (USA) manufactured.

2.1 PIPE
A. Type K copper for piping underground or beneath concrete slab. 3/4 inch minimum under slabs. Trap primer supplies shall be ½ inch.
B. Type L hard drawn copper for above ground applications.

2.2 FITTINGS
A. Wrought copper.

2.3 CONNECTIONS
A. Sweat copper type with 95/5 or 96/4 Tin-Antimony solder.
B. Joints under slabs, if allowed by local codes, shall be brazed.

2.4 BALL VALVES
A. Use ball valves exclusively unless otherwise specified. Ball valves shall be by single manufacturer from approved list below. Valves shall be for 150 PSI SWP.
B. Approved Manufacturers
1. Nibco-Scott T595 or S595 or equal by
2. ConBraCo (Apollo)
3. Crane
4. Hammond
5. Stockham
6. Watts

2.5 STOP & WASTE VALVES
A. Approved Manufacturers
1. Mark II Oriseal stop & waste valve H15134 by Mueller
2. Buffalo screw type curb box H-10350 complete with lid and H-10349 enlarged base by Mueller.

2.6 BACKFLOW PROTECTIONS
A. Approved Manufacturers
2. FEBCO Model No. 825 or Model No. 880 - R.P. Backflow Preventer.
4. ConBraCo.
2.7 COMBINATION PRESSURE REDUCING VALVE/STRAINER
   A. Integral stainless steel strainer, or separate "Y" strainer installed upstream of pressure reducing valve.
   B. Built-in thermal expansion bypass check valve.
   C. Approved Manufacturers
      1. Watts U5B or equal by
      2. Cash Valve
      3. Spencer
      4. Wilkins

2.8 INSULATING COUPLINGS
   A. Suitable for at least 175 PSIG WP at 250°F.
   B. Approved Manufacturers -
      1. Central Plastics Co
      2. Victualic Co
      3. Watts Regulator Co

2.9 SLEEVES
   A. Sleeves shall be standard weight galvanized iron pipe, Schedule 40 PVC, or 14 gauge galvanized sheet metal two sizes larger than pipe or insulation.

PART 3 - EXECUTION

3.1 INSTALLATION
   A. Install piping under slabs without joints where possible.
   B. Locate cold water lines a minimum of 6 inches from hot water line.
   C. Furnish and install complete system of piping, valved as indicated or as necessary to completely control entire apparatus. Pipe drawings are diagrammatic and indicate general location and connections. Piping may have to be offset, lowered, or raised as required or directed at site. This does not relieve this Division from responsibility for proper erection of systems of piping in every respect.
   D. Properly support piping and make adequate provisions for expansion, contraction, slope, and anchorage.
      1. Cut piping accurately for fabrication to measurements established at site and work into place without springing or forcing.
      2. Do not use pipe hooks, chains, or perforated metal for pipe support.
      3. Remove burr and cutting slag from pipes. All pipe and tube shall be reamed to the full inside diameter of the pipe and tube.
      4. Make changes in direction with proper fittings.
      5. Insulate hangers for copper pipe from piping by means of at least two layers of Scotch 33 plastic tape.
      6. Support piping at 8 feet on center maximum for pipe 1-1/4 inches or larger and 6 feet on center maximum for pipe one inch or less. Provide support at each elbow. Install additional support as required.
      7. Suspend piping from roof trusses or clamp to vertical walls using Unistrut and clamps (except underground pipe). Laying of piping on any building member is not allowed.
   E. Arrange piping to not interfere with removal of other equipment, ducts, or devices, or block access to doors, windows, or access openings. Provide accessible, ground joint unions in piping at connections to equipment.
   F. Make connections of dissimilar metals with insulating couplings.
   G. Provide sleeves around pipes passing through floors, walls, partitions, or structural members.
      1. Seal sleeves with plastic or other acceptable material.
      2. Do not place sleeves around soil, waste, vent, or roof drain lines passing through concrete floors on grade.
   H. Cap or plug open ends of pipes and equipment to keep dirt and other foreign materials out of system. Do not use plugs of rags, wool, cotton waste, or similar materials.
   I. Install piping systems so they may be easily drained.
   J. Grade soil and waste lines within building perimeter ¼ inch fall per ft in direction of flow or as noted on the plans.
K. Insulate water piping buried within building perimeter.
L. Do not use reducing bushings, street elbows, or close nipples.
M. Bury water piping 6 inches minimum below bottom of slab and encase all water lines in PVC or ABS sleeves, a minimum of 2 pipe sizes larger than water line being encased and the insulation installed on this piping. Install 2 inches minimum of sand around the encasement pipe.

3.2 FIELD QUALITY CONTROL
A. Before pipes are covered, test systems in presence of Architect at 100 psi hydrostatic pressure for two hours and show no leaks.
B. Sterilize domestic water system with solution containing 250 parts per million minimum of available chlorine. Introduce chlorinating materials into system in manner approved by Architect. Allow sterilization solution to remain for 24 hours and open and close valves and faucets several times during that time.
C. After sterilization, flush solution from system with clean water until residual chlorine content is less than 0.2 parts per million.
D. Water system will not be accepted until negative bacteriological test is made on water taken from system. Repeat dosing as necessary until such negative test is accomplished.

END OF SECTION
SECTION 22 1119
DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. General conditions Division 01 and Section 220501 apply to this section.

1.2 SUMMARY
   A. Includes But Not Limited To
      1. Furnish and install items specified in this Section and/or described in Contract
         Documents.
      2. All pipe, fittings, and valves shall be domestic (USA) manufactured.

PART 2 - PRODUCTS

2.1 FLOW CONTROL FITTINGS
   A. Vandal proof type and fit faucet spout of fixture used. Flow shall be controlled as required by
      local codes.

2.2 CONDENSATE DRAINS
   A. Provide Type M copper for condensate drains from air handling units, fan coil units, furnace
      coils, and cooler/freezers. Support piping and protect from damage.
   B. Provide schedule 40 PVC for condensate from high tech furnaces, boiler, and water heater.
   C. Install 3 inch deep seal, vented water trap adjacent to coil connection.
   D. If condensing equipment is installed without a clarifier, the condensate lines shall be PVC pipe
      and fitting. Secure all piping.

2.3 PRESSURE GAUGES
   A. Cast aluminum case
   B. Chrome plated ring
   C. Clear glass window
   D. Phosphor bronze alloy steel bourdon tube
   E. ½ percent scale range accuracy
   F. 4-1/2 inch diameter dial face
   G. Range 0 to 100 psig.
   H. Liquid Filled.
   I. Approved Manufacturers
      1. Trerice
      2. Swagelok
      3. Weiss
      4. Ashcraft

2.4 BRASS GAUGE COCKS
   A. Approved Manufacturers
      1. Ashcroft
      2. Weiss
      3. Trerice
      4. Swagelok

PART 3 - EXECUTION

3.1 INSTALLATION
   A. Connect gauges to pipe with ¼ inch connections ball valve.

END OF SECTION
SECTION 22 1313
FACILITY SANITARY SEWER OUTSIDE BUILDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. General conditions section 01 and section 230501 and 220553 apply to this section.
   B. Section 220501-3.1 Criteria for performance of excavation and backfill.

1.2 SUMMARY
   A. Includes But Not Limited To
      1. Furnish and install a storm drain piping systems from a point 5 ft outside the building to a
         sewer main as shown on the plans.
      2. Perform excavation and backfill required by work of this Section.
      3. The pipe shall be laid on virgin soil or compacted fill grade to the slope indicated on the
         plans and/or as directed by local code.

PART 2 - PRODUCTS

2.1 BURIED LINES
   A. Service weight, single-hub type cast iron soil pipe and fittings meeting requirements of ASTM A 74-87, "Specification for Cast Iron Soil Pipe & Fittings".
   B. Plastic pipe conforming to IAPMO and ASTM specifications will be acceptable where permitted by local code. Installation shall conform to the manufacturers recommendations.
   C. Service weight no-hub, cast iron soil pipe or as approved by local code.
   D. Joint Material
      1. Bell & Spigot Pipe - 50% oakum and 50% lead, well caulked, or rubber gaskets meeting requirements of ASTM C 564-88, "Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings".
      4. As recommended by the pipe manufacturer of plastic pipe.

PART 3 - EXECUTION

3.1 INSTALLATION
   A. Do not calk threaded work, all piping must be solid, which will be installed in a soil hub fitting.
   B. Slope horizontal pipe at 1/4 in/ft or, 1/8 in/ft, or as shown on plans. Must be compliance with all local codes.
   C. Place cleanouts as follows
      1. Where shown on Drawings and near bottom of each stack and riser.
      2. At every 90 degree change of direction for horizontal lines.
      3. Every 100 feet of horizontal run.
      4. Extend cleanout to accessible surface. Do not place cleanouts in carpeted floors. In such locations, use wall type cleanouts.
      5. All cleanout to grade and floor cleanouts shall be nickel bronze tops unless otherwise stated on drawings.

3.2 FIELD QUALITY CONTROL
   A. Before piping is covered, conduct tests for leaks and defective work. Notify Architect/Engineer prior to testing. Correct leaks and defective work. Fill roof drain system to roof level with water, 10 feet minimum, and show no leaks for two hours.

END OF SECTION
FACILITY SANITARY SEWERS OUTSIDE THE BUILDING 22 1313 - 1
PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. General conditions Division 01 and Section 220501 apply to this section.

1.2 SUMMARY
A. Provide and install a propane gas piping system as shown on the plans
1. Perform excavation and backfill required for work of this Section.
2. Furnish and install gas piping and fittings as described in Contract Documents from liquid propane storage tank to main shut off valve at the building.
3. All pipe, fittings, and valves shall be domestic (USA) manufactured.

1.3 REFERENCES
A. American Society for Testing and Materials

1.4 QUALITY ASSURANCE
A. Requirements of Regulatory Agencies - Lay underground pipe in accordance with federal pipeline safety regulations, NFPA 58, and local regulations and specifications.
B. Qualifications
1. Welders shall be certified and bear evidence of certification 30 days before commencing work on project. If there is doubt as to proficiency of welder, Owner’s Representative may require welder to take another test. This shall be done at no cost to the Owner. Certification shall be by Pittsburgh Testing Laboratories and other approved authority.
2. Polyethylene pipe installers shall be properly trained and certified in procedure for joining polyethylene pipe.

1.5 DELIVERY, STORAGE & HANDLING
A. Do not store polyethylene pipe so it is exposed to sunlight.

PART 2 - PRODUCTS

2.1 COMPONENTS
A. Above-Ground Pipe & Fittings - Black carbon steel, butt welded, Schedule 40 pipe meeting requirements of ASTM A 53. Welded forged steel fittings meeting requirements of ASTM A 234.
B. Below-Ground Pipe & Fittings - Polyethylene pipe and fittings meeting requirements of ASTM D 2513 with No. 14 coated copper tracer wire.

PART 3 - EXECUTION

3.1 INSTALLATION
A. Excavate and backfill as specified in Earthwork Section with following additional requirements
1. Runs shall be as close as possible to those shown on Drawings.
2. Excavate to required depth.
3. Bottom of trenches shall be hard. Tamp as required.
4. Remove debris from trench prior to laying of pipe.
5. Do not cut trenches near footings without consulting Architect.
6. Place 4 inches of sand around pipe before trench is backfilled.
7. Bury outside pipe 12 inches minimum below frost line or 18 inches minimum below finish
grade, whichever is deeper.
8. Pressure test piping to 60 psig for four (4) hours and show no leaks.
9. Backfill only after pipe lines have been tested, inspected, and approved by the Architect.

B. General installation shall be as specified in Division 22.
1. Steel pipe 2-1/2 inches and larger shall have welded fittings and joints.
2. Provide 2 foot minimum steel pipe between vertical rise of riser and end of polyethylene line if anode-less riser is not used. Use plastic-to-steel transition or compression fitting between end of service line and steel riser. Provide cathodic protection for steel riser or use anode-less riser.
3. Place tracer wire above polyethylene pipe from building to liquid propane bulk tanks.

3.2 CLEANING
A. Remove excess earth from site or place as directed by Architect.

END OF SECTION
SECTION 22 1316
FACILITY SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. General conditions Division 01 and Section 220501 apply to this section.
B. Section 220501-3.1 Criteria for performance of excavation and backfill.
C. Section 221313 Sewage piping from 5 feet out from building to main.
D. Section 022200 and 221322 Storm Drain piping.
E. Section 221313-3.1-G Installing of Copper roof jacks.
F. Section 221313-3.1-G2Furnishing and installing of lead roof jacks.
G. Section 078400 Quality Fire Stop Material.

1.2 SUMMARY
A. Includes But Not Limited To
1. Furnish and install soil, waste, and vent piping systems within building and connect with outside utility lines 5 feet out from building where applicable.
2. ASTA Testing and Material Standards No. 74, 564, 891, 2235, 2231, 2321, etc.
3. Perform excavation and backfill required by work of this Section.
B. Products Furnished But Not Installed Under This Section
1. All roof flashings.
2. Verify with roofing contractor for type of roof flashing to match roofing material and warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURING
A. All pipe and fittings shall be domestic (USA) manufactured.

2.2 BURIED LINES
A. Service weight, single-hub type cast iron soil pipe and fittings meeting requirements of ASTM A 74-87, "Specification for Cast Iron Soil Pipe & Fittings".
B. Plastic pipe conforming to IAPMO and ASTM specifications will be acceptable where permitted by local code (ABS or PVC schedule 40 pipe).
C. Service Weight, no-hub, cast iron soil pipe or as approved by local code.
D. Joint Material
1. 50% oakum and 50% lead, well caulked.
3. No-Hub Pipe- Neoprene gaskets with stainless steel cinch bands
4. As recommended by the pipe manufacturer of plastic pipe.

2.3 ABOVE GRADE PIPING & VENT LINES
A. Same as specified for buried lines except schedule 40 or Galvanized steel piping may be used above grade.
B. Vent lines 2-1/2 inches or smaller may be Schedule 40 galvanized steel.
C. All ABS or PVC lines and fittings above finished grade shall be insulated for noise abatement.
D. Plastic pipe conforming to IAPMO and ASTM specifications will be acceptable where permitted by local codes.
E. Joint Material
1. Bell & Spigot Pipe - 50% oakum and 50% lead, well caulked, or rubber gaskets meeting requirements of ASTM C 564-88, "Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings".
4. Cleaning (Primers) and solvent cement (GWE) shall be installed as per manufacturer’s recommendations.
5. ABS or PVC - Glued fitting as per manufacturer’s recommendations.
2.4 BURIED AND ABOVE GRADE ACID WASTE AND VENT LINES
   A. Schedule 40 polypropylene acid waste pipe, manufactured to dimensions and tolerances of ASTM F 1412. The pipe shall be fire retardant polypropylene material conforming to ASTM D4101.
   B. Fitting shall be schedule 40 polypropylene, manufactured to dimensions as per ASTM F1412. The polypropylene material shall be fire retardant and conform to ASTM D4101.
   C. Joining methods between the pipe and fittings shall be mechanical joint, meeting ASTM F 1412 or electrofusion to produce a hermetically sealed joint, conforming to ASTM 1290.
   D. All acid waste lines and fittings above floor shall be insulated for noise abatement.
   E. Approved products
      1. Zurn
      2. Orion

2.5 ABOVE GRADE ACID WASTE AND VENT LINES LOCATED IN PLENUM OR FIRE RATED ROOM OR STRUCTURE.
   A. Schedule 40 polyvinylidene Fluoride (PVDF) acid waste pipe, manufactured to dimensions and tolerances of ASTM F1672. The pipe shall be fire resistant Polyvinylidene Fluoride material conforming to ASTM D3222.
   B. Fitting shall be schedule 40 polyvinylidene Fluoride, manufactured to dimension per ASTM F1673. The polyvinylidene Fluoride (PVDF) material shall be fire resistant and conform to ASTM D3311 and F1673.
   C. Joining method between the pipe and fittings shall be mechanical joint, meeting ASTM F1673.
   D. Approved products
      1. Zurn
      2. Orion
   E. All acid waste lines and fittings shall be insulated with an approved insulation that meets the flame smoke rating for plenum or fire rated rooms or structure. If necessary the insulation shall be wrapped with a plenum rated tape.

PART 3 - EXECUTION

3.1 INSTALLATION
   A. Do not caulk threaded work, all piping must be solid, which will be installed in soil and hub fittings.
   B. Slope horizontal pipe at ¼ in/ft.
   C. Place cleanouts as follows
      1. Where shown on Drawings and near bottom of each stack and riser.
      2. At every 90 degree change of direction for horizontal lines.
      3. Every 100 feet of horizontal run.
      4. Extend cleanout to accessible surface. Do not place cleanouts in carpeted floors. In such locations, use wall type cleanouts.
      5. Meet all code requirements for cleanouts.
      6. All cleanout to grade and floor cleanouts shall be nickel bronze tops unless otherwise stated on the drawings.
   D. Each fixture and appliance discharging water into sanitary sewer or building sewer lines shall have seal trap in connection with complete venting system so gasses pass freely to atmosphere with no pressure or syphon condition on water seal.
   E. Vent entire waste system to atmosphere. Discharge 14 inches above roof. Join lines together in fewest practicable number before projecting above roof. Set back vent lines so they will not pierce roof near edge or valley.
   F. Use torque wrench to obtain proper tension in cinch bands when using hubless cast iron pipe. Butt ends of pipe against centering flange of coupling.

*** Roof systems other than concrete roof tile ***
G. Vent pipes passing through the roof are to have a roof flashing, fitted snugly around pipes and caulk between flashing and pipe with flexible waterproof compound. Flashing base shall be at least 24 inches square. Coordinate with roofing contractor to match flashing to roofing materials.
   1. Consult roofing contractor for exact type of flashings. Coordinate with the engineer and the roofing contractor for this information.

H. Refer to section 220529 for hangers and support of this piping.

3.2 FIELD QUALITY CONTROL

A. Before piping is covered, conduct tests for leaks and defective work. Notify Architect prior to testing. Correct leaks and defective work. Fill waste and vent system to roof level with water, 10 feet minimum, and show no leaks for two hours.

END OF SECTION
SECTION 22 1322
LIQUID PROPANE GAS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. General conditions Division 01 and Section 220501 apply to this section.

1.2 SUMMARY
A. Provide and install a propane gas piping system as shown on the plans.
1. Perform excavation and compaction required for work of this Section.
2. Furnish and install gas piping and fittings as described in Contract Documents from liquid propane storage tank to main shut off valve at the building.

1.3 REFERENCES
A. American Society for Testing and Materials

1.4 QUALITY ASSURANCE
A. Requirements of Regulatory Agencies - Lay underground pipe in accordance with federal pipeline safety regulations, NFPA 58, and local regulations and specifications.
B. Qualifications
1. Welders shall be certified and bear evidence of certification 30 days before commencing work on project. If there is doubt as to proficiency of welder, Owner’s Representative may require welder to take another test. This shall be done at no cost to the Owner. Certification shall be by Pittsburgh Testing Laboratories and other approved authority.
2. Polyethylene pipe installers shall be properly trained and certified in procedure for joining polyethylene pipe.

1.5 DELIVERY, STORAGE & HANDLING
A. Do not store polyethylene pipe so it is exposed to sunlight.

PART 2 - PRODUCTS

2.1 MANUFACTURING
A. All pipe and fittings shall be domestic (USA) manufactured.
B. All valves shall be domestic (USA) manufactured.

2.2 COMPONENTS
A. Above-Ground Pipe & Fittings - Black carbon steel, butt welded, Schedule 80, 300 lbx fittings, pipe meeting requirements of ASTM A 53. Welded forged steel fittings meeting requirements of ASTM A 234.
B. Below-Ground Pipe & Fittings - Polyethylene pipe and fittings meeting requirements of ASTM D 2513 with No. 14 coated copper tracer wire.

PART 3 - EXECUTION

3.1 INSTALLATION
A. Excavate and backfill as specified in Earthwork Section with following additional requirements
1. Runs shall be as close as possible to those shown on Drawings.
2. Excavate to required depth.
3. Bottom of trenches shall be hard. Tamp as required.
4. Remove debris from trench prior to laying of pipe.
5. Do not cut trenches near footings without consulting Architect.
6. Place 4 inches of sand around pipe before trench is backfilled.
7. Bury outside pipe 12 inches minimum below frost line or 18 inches minimum below finish grade, whichever is deeper.
8. Pressure test piping to 60 psig for four (4) hours and show no leaks.
9. Backfill only after pipe lines have been tested, inspected, and approved by the Architect.

B. General installation shall be as specified in Division 22.
   1. Steel pipe 2-1/2 inches and larger shall have welded fittings and joints.
   2. Provide 2 foot minimum steel pipe between vertical rise of riser and end of polyethylene line if anode-less riser is not used. Use plastic-to-steel transition or compression fitting between end of service line and steel riser. Provide cathodic protection for steel riser or use anode-less riser.
   3. Place tracer wire above polyethylene pipe from building to liquid propane bulk tanks.

3.2 CLEANING
   A. Remove excess earth from site or place as directed by Architect.

END OF SECTION
SECTION 22 1323
PROPANE GAS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of contract, including General and Supplementary Conditions and Division-01 Specification sections, apply to work of this section.
B. Section 230501 Basic Mechanical Materials and Methods sections apply to work of this section.
C. Sections 220529 hangers and supports.

1.2 SUMMARY
A. The contractor shall provide and install gas piping (Natural gas) from the point of service to the last unit being served, as shown on the plans.
B. The gas piping shall be supported as outlined in section 220529.
C. Coordinate the piping with the serving utility and/or the tank supplier if the fuel be propane. The contractor shall provide under contract the valves connection components, etc. required for connection. If metered the utility shall provide the service the meter (natural gas) with connections being made there to.
D. If the meter requires a base the contractor shall so provide.

1.3 QUALITY ASSURANCE
A. Qualifications
   1. Welders shall be certified and bear evidence of certification 30 days prior to commencing work on project. If there is doubt as to proficiency of welder, Owner's Representative may require welder to take another test. This shall be done at no cost to Owner. Certification shall be by Pittsburgh Testing Laboratories or other approved authority.

PART 2 - PRODUCTS

2.1 MANUFACTURING
A. All pipe and fittings shall be domestic (USA) manufactured.
B. All valves shall be domestic (USA) manufactured.

2.2 PIPE
A. Meet requirements of ASTM A 53-89a, "Specification for Pipe, Steel, Black & Hot-Dipped Zinc-Coated Welded & Seamless".
B. Carbon steel, butt welded, Schedule 40 black steel pipe.

2.3 FITTINGS
A. Black Pipe
   1. Welded forged steel fittings meeting requirements of ASTM A 234-89a, "Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures", or standard weight malleable iron screwed.

2.4 VALVES
A. 125 psi bronze body ball valve, UL listed
B. Approved Manufacturers & Models
   1. ConBraCo - "Apollo" series 80-100
   2. Jenkins - FIG-30-A
   3. Jomar - Model T-204
   4. McDonald - 3410
   5. PGL Corp - "Red Cap" gas ball valve
   6. Watts - Model B-6000-UL

2.5 EARTHQUAKE ACTUATED GAS SHUT-OFF VALVES
A. Aluminum Body Valve.
B. Stainless Steel Ball Shut-off.
C. Manual reset.
E. Approved Manufacturers:
1. Safe-T-Quake.
2. Koso
3. Quakemaster.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Pipe installed underground, through air plenums, in walls, and pipes 2-1/2 inches and larger shall have welded fittings and joints. Other pipe may have screwed or welded fittings.

B. Wrap and lay underground pipe in accordance with local gas utility company regulations and specifications.

C. Install gas cocks on lines serving boilers, furnaces, duct heaters, and water heaters adjacent to boiler, furnace, or heater on outside of boiler, furnace, or heater cabinet and easily accessible.

D. Do not use flexible pipe connections to boilers, furnaces, duct heaters, or hot water heaters.

E. Install dirt leg with pipe cap, 6 inches long minimum, on each vertical gas drop to heating equipment.

F. Use fittings for changes of direction in pipe and for branch runouts.

G. Protection Coatings: All underground steel pipes shall be wrapped with "Scotchwrap" NP. 50 tape to give not less than two complete layers on the entire underground piping system. Factory wrapped pipe in accordance with American Water Works Standard, or X-tru-Coast Plastic coated pipe will be acceptable.

H. Paint main gas valve red and label "Main Gas Shut-off" with a permanent label.

I. Paint all exposed gas piping. Use a rust inhibitor primer coat and finish coat (gray) on all piping exposed to the weather.

J. Install earthquake activated gas shut-off valve downstream of meter before entering building with gas line (required only in seismic zones 3 and 4).

END OF SECTION
SECTION 22 1400

ACCUBRINE AUTOMATED BRINE MAKER

PART 1 – GENERAL

1.1 SUMMARY

A. It is the intent of this document to provide specifications for a downward flow automatic brine production system(s) where the salt acts as a filter bed as the water moves down through to sump area and filter screen. The automatic brine production system(s) shall be capable of producing approximately 6,000 gallons of brine per hour, (based on available water pressures and volume and bulk salt quality). The brinemaker when purchased with specific options is capable of producing a blended product by injecting up to three additives each with a ratio between 0 and 100%. Depending on the model purchased, it is capable of remotely filling trucks with brine, blend or additive liquids, and recording truck fill data via a numerical password entry system. The system is capable of flushing all waste sediment collected in the bottom of the salt tank. Complete automation of brine production without the intervention of an operator after initial system start and automatically monitor and control brine concentration during production.

PART 2 – PRODUCTS

2.1 SALT HOPPER

A. Manufacturing

1. The salt hopper shall have a minimum capacity of 5 cubic yards.
2. The salt hopper shall hold approximately .75 cubic yards of sediment without interfering with brine outlet.
3. Minimum inside dumping width shall be no less than 120” inches.
4. The hopper shall be constructed of 16,000 lb tensile strength fiberglass and isophthalic resin.
5. All inside surfaces shall be coated with a ceramic resin .050” thick.
6. Vessel shall have structural integral ribs to limit flex to within 1” from full to empty.
7. Overall thickness of fiberglass and resin in the salt tank shall be .35” thick, structural areas such as ribs, corners and floor shall have additional layers of woven fiberglass matt for an overall thickness of .50”
8. Sediment collection area shall have a 15 degree slope towards a 12”X 12” sump to promote debris clean out.
9. For ease and expediency of cleaning, the system shall be capable of being cleaned via a flush circuit without disassembly of any components of the unit.
10. For ease and expediency of cleaning accumulated sediment, the system shall be capable of being cleaned with the salt hopper full of salt by a process of opening sump outlet cap and water flush valves. Any salt tanks that require dumping of the hopper or trap doors for clean out shall be deemed unacceptable.
11. There shall be a fresh water flushing system to force sediment to sump and out of sump.
12. There shall be a 4” stainless steel bulkhead fitting and 4” ball valve for cleanout purposes.
13. There shall be no air gaps in the vessel areas between sloped floor and mounting feet.
14. All Valves, bulkhead fittings, etc. 1” and larger shall be manifold type fittings.
15. There shall be a pressure transducer connected to the PLC to activate brine pump on and off and water flow into salt tank. These levels shall be adjustable from the HMI Interface and be adjustable to within 1 Gallon increments.
16. Transducer shall have an air capillary to the inside of salt hopper.
17. Vessel shall have 2” male cam-lock type fittings and on/off ball valves for hose connections (fresh water, brine return, brine outlet to pump).
18. All metallic items shall be 304 stainless steel.
19. Salt tank shall have a stainless steel debris screen located above the sump and sediment collection area.
20. The screen shall have 3/16” diameter perforations.
21. To allow for maximum flow, the debris screen shall have 60 square feet of surface area.
22. Debris screen shall be capable of supporting 10,000 lb of salt evenly distributed across the total area.
23. Screen frame shall have six 3/8” diameter stainless steel eyebolts connected to a poly sling to allow removal of the screen from the tank for cleaning or maintenance purposes.

2.2 CONTROL SYSTEM

A. Manufacturing

1. The control system shall be a continuous brine production system to be located inside a climate controlled building with above freezing temperatures.
2. The main control panel shall be made up two separate enclosures – a power enclosure and a control enclosure.
   a. **Three phase power option:** The three phase power enclosure will require a customer supplied 30A, 208VAC three phase electrical service and junction box. Machine will be equipped with receptacle, receptacle housing and plug. Customer will install Cargill supplied receptacle and receptacle housing. The control panel will be equipped with 10 feet of SOOW type cord with matching plug.
   b. The control panel shall be powered by a 24VDC power supply and shall have all low-voltage control components.
3. The brinemaker frame will be constructed of 304 SS 1-3/4” square tubing with 1/8” wall thickness. 1-1/2” x 1-1/2” x ¼” SS angle supports the 1” thick x 1-1/2” square fiberglass grating that the components are anchored to and fitted with a 304 brushed stainless steel front cover.
4. The Brine concentration sensor shall monitor the brine for temperature and automatically compensate brine concentration accordingly.
5. The brine concentration controller shall have the internal feature to be calibrated using a single point calibration method and setup using a 21-point concentration curve.
6. Brine concentration sensor shall be a TOROIDAL type conductivity sensor and must be mounted in the supplied arrangement for it to work properly.
7. All brine exiting the salt tank shall pass over the brine concentration sensor that measures the conductivity of the sodium chloride brine where it is then equated to a concentration by weight.
8. System shall include an HMI with a color LCD touch screen display (7” diagonal 16:9 wide screen). Information on the display screen shall include, but not be limited to:
   a. Login screen that can be setup for multiple individual users at different “access” levels.
   b. HMI screen will have a central “Home” screen for access to multiple functional screens depending on the model and options purchased.
   c. HMI will show graphic illustration of liquid flow during brine production process.
9. Calibration shall be performed from the HMI interface located on the face of the machine. Programming parameters shall be password protected.
10. The programmable logic controller (PLC) shall have a non-volatile memory with SD Flashcard back up of programming.
11. As the brine concentration is pumped from the salt tank, the brine shall be monitored for the desired concentration. Systems requiring an operator to manually test brine concentration will be deemed unacceptable.
12. If the brine concentration is above the target, the brine shall be automatically corrected via an automatic proportional dilute valve that is controlled to add the proper volume of fresh water to achieve the target concentration as it is being sent to the brine storage tank.
13. Once brine is at the desired the brine will automatically be diverted to pre-designated storage tank.
14. In the event that the concentration is below the minimum desired concentration, the system shall automatically divert brine to the salt tank for subsequent passes through the salt bed to achieve the desired concentration.
15. The control system shall be configured to accept a signal from a pressure transducer located in a storage tank to automatically stop brine production when tank is full, or when production batch is complete.

16. Control system shall use an on board magnetic type flowmeter to measure total gallons of brine produced and calculate the approximate quantity of water used and salt used daily and seasonally for record keeping purposes.

17. The control system will allow the customer to set a customized recirculation schedule based on wall clock timing. The pump “on” and “off” times shall be programmable to desired parameters via the HMI. This feature may only be available with certain options.

18. Electrical control panel shall be UL listed

19. The system shall be completely self-diagnostic to include the pump, electrical valves and input signals from other electrical components.

20. All electric valves and sensors shall communicate with the controller to confirm the current state.

21. In the event of a component failure, the system shall automatically shut down and inform the operator of the specific failure.

22. All wetted parts on control panel except for pump shall manifold type glass filled polypropylene rated for 150 psi.

23. Electric components mounted onto control panel shall have UL rated conduit protecting connections and wiring outside of the enclosure.

24. Individual components shall have circuit breakers. Circuit Breakers shall have diagnostic tieback to the PLC to alert operator of faulted conditions.

25. All cable and/or wires from each electrical component housed on the brinemaker will be housed in a combination of flexible seal tight and non-corrosive PVC conduit from the component to the either the power or control enclosures mounted on the brinemaker support frame.

2.3 MECHANICAL COMPONENTS

A. Pump shall be constructed of cast 304 stainless steel with a stainless steel shaft and impeller.

B. Electric pump motor shall be thermally protected 5 HP 240 Volt single phase or 5 hp 208V three phase.

C. Pump seals shall be constructed of carbon/ceramic faces, viton elastomers, and stainless metals.

D. Pump shall be rated for 200 gpm @ approximately 60 ft of head

E. Dilute circuit shall have a 1-1/4” analog control valve for controlling brine concentration proportional to the conductivity output

F. Pump shall be “close-coupled” connection to the motor

G. All pump parts shall be replaceable in case of a pump failure.

H. All fittings and valves shall be manifold type glass filled polypropylene.

I. Wetted components shall be kept to a minimum; all steel components shall be constructed of 304-grade stainless steel.

J. All fasteners shall be constructed of stainless steel.

PART 3 – TRUCK LOADING AND BLENDING SYSTEM SPECIFICATIONS

3.1 SYSTEM SPECIFICATIONS

A. The truck loading and blending system shall be modular and can be assembled as a combination of the three following options: Truck Loading System, Additive Module, Truck Offload Option

3.2 TRUCK LOADING SYSTEM

A. The main control panel shall be made up two separate enclosures – a power enclosure and a control enclosure.

1. Three phase power option: The three phase power enclosure will require a customer supplied minimum 60A, 208VAC, three phase electrical service Machine will be equipped with receptacle, receptacle housing and plug. Customer will install Cargill supplied receptacle and receptacle housing. The control panel will be equipped with 10 feet of SOOW type cord with matching plug.

2. The control enclosure shall be shared with the Accubrine brinemaker control enclosure.
B. The truck loading system shall be comprised of a 304 stainless steel frame consisting of 304 SS 1-3/4" square tubing with 1/8" wall thickness. 1-1/2" x 1-1/2" x ¼" stainless steel angle supports the 1" thick x 1- 1/2" square fiberglass grating to which the pump, all necessary plumbing fittings, electrical fittings and valves are fastened/anchored to.

C. The truck loading system shall be controlled by either an independent control panel that can be mounted onto the stainless steel frame if using with another brand or version of brinemaker system OR with the control panel mounted on the Accubrine NXTEGN brinemaker if used in tandem with it.

D. Brine or brine mixtures based on the recipe page setup in the HMI screen can be sent directly to liquid tanker trucks via the Remote Truck Fill HMI.

E. The truck loading system will include a junction box mounted to the skid that will house the components needed for the valves and flowmeters. It will be connected via cable to the main control panel.

F. The truck loading system shall operate independently from the Accubrine brine maker system as it includes a separately operated pump. The pump shall be a close coupled style pump rated for 300 gallons per minute at an approximate head pressure of 65 psi.

G. The pump shall be stainless steel cast with stainless steel wetted parts. All pump parts shall be replaceable.

H. The pump shall be powered by a 7.5 hp motor, 3450 rpm, TEFC, 230V, with 3" diameter suction and discharge openings.

I. The valve controlling the supply volume of the brine shall be a 3" control valve located on the suction side of the pump.

J. A 24VDC, 3" electrically actuated two-way discreet ball valve will be positioned on the discharge side of the pump to enable brine to be sent directly to a tanker truck or to the storage tank recirculation circuit.

K. A 2" electrically actuated two-way discreet ball valve will be located on the discharge side of the pump allowing for brine to be recirculated to the brine storage tank when in the "open" position.

L. All cable and/or wires from each electrical component housed on the truck loading skid will be housed in a combination of flexible seal tight and non-corrosive PVC conduit from the component to the either the power or junction enclosures mounted on the support frame.

3.3 FULLY AUTOMATED, REMOTE MOUNTED, TRUCK FILL STATION

A. The truck loading system shall come standard with a remote mounted truck fill station operated via a 3" HMI with navigation buttons and keypad.

B. The remote truck fill station system shall include a NEMA 4X control panel with 3" HMI with navigation buttons and keypad that is used to fill tanker trucks with a brine and/or brine blend and necessary hose connecting a quick disconnect 3" manual shutoff valve to the truck loading system skid.

C. The HMI shall have the following input fields and screens showing such: Truck numeric identification, numeric product code, volume in gallons to be loaded, start operation, stop operation.

D. 4.3.4 The truck loading system will log the following information that will be accessible to view and download via the main control panel HMI: truck numeric identification, Date, Time, Quantity of material loaded, and product type.

3.4 BRINE ADDITIVE MODULE

A. Each additive module can be added to the truck loading system in order to allow the customer to make customized blended brine mixes or recipes. One additive module is required per additive the customer wishes to mix with brine.

B. Each additive module shall be capable of introducing an additive to be mixed in-line with liquid brine at a volume ratio mix that can be pre-set in a recipe setup page. The mix of each additive can vary between 0-100% on a volumetric fill rate basis. The additive plumbing module will also enable the operator to recirculate each additive storage tank, if the tanks are plumbed according to recommendation.

C. One additive module is needed per additive that the customer wishes to blend with brine, up to three additives total.

D. Each additive module shall come equipped with an electrically actuated control valve, an additive flowmeter, an electrically actuated ball valve and all appropriate mounting hardware.
E. The brine module includes a flowmeter that shall have a 3” inner diameter with corrosion-resistant, magnetic flow sensor that features no moving parts and able to produce a pulse 24V pulse output signal and able to mount to the brine module located on the truck loading/blending skid.

F. Each control valve shall be powered by 24VDC and controlled via a 4-20 mA output signal provided by the PLC or ancillary I/O.

G. Each control valve shall be actuated via a customized PID loop for precise valve positioning to achieve the desired volumetric mixing ratios.

H. Each additive line flowmeter shall be a corrosion-resistant, magnetic flow sensor that features no moving parts and able to produce a pulse 24V pulse output signal and able to mount to the additive module.

I. Each additive module shall be mounted onto the fiberglass skid depending on the number modules ordered by the customer/user.

J. All electrically actuated valves shall be controlled via the PLC program and HMI setup for all truck filling, additive blending and recirculation operations.

K. There shall be additive storage tank volume sensors to determine if enough volume of each additive is available to produce desired volume ratio batch and to provide real time volume display on the HMI.

3.5 TRUCK OFFLOAD VALVE

A. The truck offload kit will enable customers to use the pump located on the truck fill and blending system to unload brine or additive trucks into storage tanks.

B. The truck offload kit will be comprised of a 2” electrically actuated discreet ball valve that will be located on the suction side of the truck loading system pump, mounted on the truck loading skid and will include all appropriate mounting hardware and plumbing fittings to do so.

PART 4 – WARRANTY

4.1 A full parts and labor warranty shall be provided for the first year starting after installation and training are complete.

PART 5 – SITE PREPARATION

5.1 The customer will provide electric and water service to the machine per the supplied Installation Checklist specifications supplied by Cargill.

PART 6 – STANDARD FEATURES

6.1 ROLL TARP COVER

A. A roll tarp with arches and roll mechanism shall be installed onto brine maker to keep heat in and debris out.

B. Tarp shall be easily operated by one person to open top of brine maker for normal operation.

6.2 AIR PURGE SYSTEM

A. Air purge system shall divert compressed air through the water supply line leading to the salt tank. System shall be configured to automatically purge water from line via an electric valve each time the machine stops production. Air supply to be supplied via purchasing agency. Consult Accubrine Sales or Technical Support representative for more information.

6.3 STORAGE TANK PRESSURE TRANSDUCER ASSEMBLY

A. An analog pressure sensor and interconnect kit to integrate into automation process. The sensor shall be capable of communicating with the automation process to shut off brine production when storage tank is full, and will indicate storage tank volumes.
6.4 HOSE KIT
A. The Accubrine brine maker machine will come complete with one 100 ft roll of 2” EPDM rubber corrugated suction hose and appropriate fittings to connect the fresh water to the brinemaker skid, and the brine maker skid to the salt mixing tank. Based on the number of storage tanks or the distance between the skid and the storage tanks, additional hose may be required for proper plumbing. Consult your Accubrine Sales or Technical Representative for more information and quotation.
B. The Accubrine truck loading system will come complete with two 100 ft. rolls of 2” EPDM rubber corrugated suction hose and one 100 ft. roll of 3” EPDM rubber corrugated suction hose. This hose will be used to connect the truck loading system to the brine storage tank and to the truck filling station. Based on the number of storage tanks and the distance from those tanks to the truck loading skid, additional hose may be required for proper plumbing. Consult your Accubrine Sales or Technical Representative for more information and quotation.
C. Each additive module option will come complete with one 100 ft of 2” EPDM rubber corrugated suction hose. This hose will be used to connect the additive module located on the truck loading system to the additive storage tank. Based on the number of storage tanks and the distance from those tanks to the truck loading skid, additional hose may be required for proper plumbing. Consult your Accubrine Sales or Technical Representative for more information and quotation.

6.5 REMOTE ACCESS CAPABILITY
A. The system shall be capable of being accessed via the Internet. All set up and operational data shall be capable of being viewed remotely via the display. Integration with customer’s network will be the responsibility of the end user.
B. The system shall be capable of being accessed and operated via mobile device if customer so chooses. Customer will need to download appropriate apps to their mobile device to achieve this. The app needed will be specified by Cargill at time of purchase and/or installation and setup.

6.6 4” DRAIN KIT
A. A 4” valve, hose barbs and cam lever couplings shall be supplied to drain the salt tank of liquid and sediment.

PART 7 – ADDITIONAL

Additional kits that are purchased separately and are not included in the brinemaker or truck loading/blending system.

7.1 2” STORAGE TANK FITTING KIT
A. Banjo manifold flange type fitting kit with 2” manual ball-valve, one 2” 45° hose barb, two 2” manifold claps and gaskets, one 3” manifold clamps and gasket, one 3” MPT by manifold adapter, one 2” MPT by manifold adapter, 3” 2” reducing coupler, (Note: one kit required for each 2” hose installed on each storage tank)

7.2 3” STORAGE TANK FILLING KIT
A. Banjo manifold flange type fitting kit with 3” manifold manual ball-valve, one 3” 45° hose barb, two manifold clamps and gaskets, 3” MPT by manifold adapter

END OF SECTION
SECTION 23 0933
CONTROL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of contract, including General and Supplementary Conditions and Division-01 Specification sections, apply to work of this section.
B. Section 230501 Basic Mechanical Materials and Methods sections apply to work of this section.
C. Section 230933 - Furnishing and installing of temperature control dampers.
D. Division 26 - Furnishing and installing of raceway (conduit) and junction boxes, including pull wires, for temperature control system except as noted above.
E. Division 26 - Power wiring to magnetic starters, disconnect switches, and motors.
F. Division 26 - Motor starters and disconnect switches, unless integral with packaged equipment.

1.2 SUMMARY
A. Includes But Not Limited To
1. Furnish and install automatic temperature control system as described in Contract Documents.
2. Furnish and install conductors and make connections to control devices and equipment.
   Furnish and install exposed raceway (conduit) in Mechanical Rooms.
3. Calibrate, adjust, and set controls for proper operation, operate systems and be prepared to prove operation of any part of control system. This work is to be completed before pre-final inspection.

1.3 SYSTEM DESCRIPTION
A. Design Criteria
1. Install line and low voltage electrical wiring, raceway (conduit), and boxes in accordance with Division 26 of these Specifications.
2. System controls shall be single manufacturer’s products.

1.4 SUBMITTALS
A. Shop Drawings
1. Provide three copies of shop drawing submittal data for review. See Section 230501 for definitions and procedures.
B. Operation & Maintenance Data
1. Upon completion of work of this Section and prior to final inspection, provide two copies of “as-built” ATC diagrams, schematics, catalog cuts, maintenance instructions, and written operating sequence for each furnace/fan system to be included in Operation & Maintenance Manual specified in Section 230501.

PART 2 - PRODUCTS

2.1 THERMOSTATS AND DAMPERS
A. Programmable low voltage type provided with automatic change over feature for both heating and ventilating stages, seven day program with one start and stop per day with three hour override, and provisions for damper operators.
B. Thermostats to be horizontally mounted.
C. Approved Thermostat Models
   1. Tekmar or Taco
   2. All others by prior approval.

2.2 CONDUCTORS
A. Color coded and #16 AWG Type TFN or THHN.
PART 3 - EXECUTION

3.1 INSTALLATION
   A. Run all wiring in conduit.
   B. Mount Room Thermostats 4'0" from floor to center of thermostat.
   C. Mount damper actuators and actuator linkages external of air flow.
   D. Provide fresh battery in each thermostat (Mallory MN1604 9 volt alkaline type or equal) and instruct custodian in battery replacement.

3.2 FIELD QUALITY CONTROL
   A. Field Service
      1. Calibrate, adjust and set controls for proper operation, operate systems and be prepared to prove operation of any part of control system. This work is to be completed before prefinal inspection.

3.3 ADJUSTING, CLEANING
   A. Remove unused wire and conduit from site and test system’s controls for two days.

END OF SECTION
SECTION 23 0513
ELECTRICAL REQUIREMENTS AND MOTORS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.
B. Section 230501 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 SUMMARY
A. This section specifies the basic requirements for electrical components which are an integral part of packaged mechanical equipment. These components include, but are not limited to factory installed motors, starters, and disconnect switches furnished as an integral part of packaged mechanical equipment.
B. Specific electrical requirements for electric motor (i.e. horsepower, voltage, phase and electrical characteristics) for the mechanical equipment are specified within the individual equipment specifications and/or noted in the schedule on the drawings.
C. All magnetic motor starters and disconnect switches not furnished as an integral part of packaged mechanical equipment shall be provided under Division 23 - Mechanical.
D. Wiring from motors of mechanical equipment to disconnect switches or junction boxes, including pushbuttons, pilot lights, interlocks, speed controllers, and similar devices shall be the responsibility of this Contractor under Division 23 where not specifically indicated under Division 26.
E. Wiring of field-mounted float control switches, flow control switches, and similar mechanical/electrical devices provided for mechanical systems, to equipment control panels shall be the responsibility of this Contractor under Division 23 where not specifically indicated under Division 26.
F. Wiring required for Automatic Controls Section 230933 shall be the responsibility of this Contractor under Division 23.

1.3 REFERENCES
A. NEMA Standard MG 1: Motors and Generators.
B. NEMA Standard ICS 2: Industrial Control Devices, Controllers and Assemblies.

1.4 SUBMITTALS
A. No separate submittal is required. Submit product data for motors, starters, and other electrical components with submittal data required for the equipment for which it serves as required by the individual equipment specification sections.

1.5 QUALITY ASSURANCE
A. All electrical components and materials shall be labeled by an approved testing agency (UL, ETL, CSA, etc.).

PART 2 - PRODUCTS

2.1 MOTORS
A. The following are basic requirements for simple or common motors. For special motors, more detailed and specific requirements are specified in the individual equipment specifications.
1. Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads.
2. Motor sizes shall be large enough so that the driven load will not require the motor to operate in the service factor range.
3. Two-speed motors shall have two separate windings on poly-phase motors.
4. Single speed motors shall be inverter - duty motors.
5. Temperature Rating: Rated for 40/C environment with maximum 50/C temperature rise for continuous duty at full load (Class A insulation). Service Factor: 1.15 for poly-phase motors and 1.35 for single phase motors.

B. Motor Construction: NEMA Standard MG 1, general purpose, continuous duty, Design "B", except "C" where required for high starting torque.

C. Frames: NEMA Standard No. 48 or 54; use driven equipment manufacturer's standards to suit specific application.

D. Bearings: Ball or roller bearings with inner and outer shaft seals; regreaseable, except permanently sealed where motor is normally inaccessible for regular maintenance; designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motor; for fractional horsepower, light duty motors, sleeve type bearings are permitted.

E. Enclosure Type: Open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation; guarded drip-proof motors where exposed to contact by employee or building occupants; weather-protected Type I for outdoor use, Type II where not housed.

F. Overload Protection: Built-in thermal overload protection and, where indicated, internal sensing device suitable for signaling and stopping motor at starter.

G. Noise Rating: "Quiet" rating on motors located in occupied spaces of building.

H. Efficiency: "Energy efficient" motors shall have a minimum efficiency as scheduled in accordance with IEEE Standard 112, test method "B". If efficiency not specified, motors shall have a higher efficiency than "average standard industry motors", in accordance with IEEE Standard 112, test method "B".

I. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, special features, and similar information.

2.2 STARTERS, ELECTRICAL DEVICES, AND WIRING

A. Motor Starter Characteristics: Enclosures NEMA, general purpose enclosures with padlock ears, except in wet location shall be NEMA 3R with conduit hubs. Type and size of starter shall be as recommended by motor manufacturer and the driven equipment manufacturer for applicable protection and startup condition.

B. Manual switches shall have pilot lights and extra positions for multi-speed motors. Overload protection shall be melting alloy type thermal overload relays.

C. Magnetic starters shall have maintained contact pushbuttons and pilot lights, properly arranged for single speed or multi-speed operation as indicated; trip-fee thermal overload relays each phase, interlocks, pneumatic switches and similar devices as required for coordination with control requirements of Division 23 Controls sections, built-in 120 volt control circuit transformer, fused from line side, where service exceeds 240 volts; externally operated manual reset, under-voltage release or protection.

D. Motor connections shall have flexible conduit, except where plug-in electrical cords are specifically indicated.

2.3 CAPACITORS

A. Features shall include individual unit cells, all welded steel housing, each capacitor internally fused, non-flammable synthetic liquid impregnated, craft tissue insulation and aluminum foil electrodes.

B. KVAR size shall be as required to correct motor power factor to 90 percent or better and shall be installed on all motors 1 horsepower or larger, that have an uncorrected power factor of less than 85 percent at rated load.

PART 3 - EXECUTION

(Not Applicable).

END OF SECTION
SECTION 23 0554
MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to this section.

1.2 SUMMARY
A. This section includes mechanical identification materials and devices.

1.3 SUBMITTALS
A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specifications Sections.
B. Product data for identification materials and devices.
C. Samples of color, lettering style, and other graphic representation required for each identification material and device.
D. Valve Schedules: Submit valve schedules for each piping system. Reproduce on standard-size bond paper. Tabulate valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification. Mark valves intended for emergency shutoff and similar special uses. Furnish extra copies (in addition to mounted copies) for Maintenance Manuals.

1.4 QUALITY ASSURANCE
A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.5 SEQUENCING AND SCHEDULING
A. Coordinate installation of identifying devices after completion of covering and painting where devices are applied to surfaces. Install identifying devices prior to installation of acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 IDENTIFYING DEVICES AND LABELS
A. General: Products specified are manufacturer’s standard products of categories and types required for each application as referenced in other Division 23 Sections. Where more than single type is specified for listed application, selection is Installer’s option, but provide since selection for each product category.
B. Stencils: Standard stencils, prepared with letter sizes conforming to recommendations of ASME A13.1. Minimum letter height is 1-1/4 inches for ducts and 3/4 inch for access doors signs and similar operational instructions.
   1. Material: Fiberboard or brass.
   2. Stencil Paint: Exterior, oil based alkyd gloss black enamel, except as otherwise indicated. Paint may be in pressurized spray-can form.
   3. Identification Paint: Exterior, oil-based alkdy enamel in colors according to ASME A13.1, except as otherwise indicated.
C. Pressure-Sensitive Pipe Markers: Manufacturer’s standard pre-printed, color-coded, pressure-sensitive vinyl pipe markers, with permanent adhesive conforming to ASME A13.1.
D. Pipes Smaller Than 6 Inches: Full-band pipe markers, extending 360 degrees around pipe at each location.
E. Pipes 6 inches And Larger: Either full-band or stip-type pipe markers, at least 3 times the letter height and of the length required for the label.
F. Lettering: Manufacturer’s standard pre-printed terms as selected by Architect.
G. Lettering: Use piping system terms as indicated and abbreviate only as necessary for each application length.
   1. Arrows: Either integrally with piping system service lettering (to accommodate both directions), or as separate unit, on each pipe marker to indicate direction of flow.
H. Plastic Tape: Manufacturer’s standard color-coded, pressure sensitive, self-adhesive, vinyl tape, at least 3-mils thick.
   1. Width: 1-1/2 inches wide on pipes with outside diameters (including insulation) less than 6 inches; 2-1/2 inches wide for larger pipes.
   2. Color: Comply with ASME A13.1, except where another color selection is indicated.
I. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch sequenced numbers. Provide a 5/32-inch hole for fastener.
   1. Material: 19-gage polished brass
   2. Material: 0.032-inch thick aluminum
   3. Material: 19-gage stainless steel
   4. Material: 3/32-inch thick plastic laminate having 2 black surfaces and a white inner layer.
   5. Material: Valve manufacturer’s standard solid plastic.
   7. Shape: As indicated for each piping system.
J. Valve Tag Fasteners: Brass chain (wire link or beaded type) or brass S-hooks.
K. Access Panel Markers: 1/16-inch thick engraved plastic-laminate markers, with abbreviated terms and numbers corresponding to concealed valve. Provide 1/8-inch center hole for attachment.
L. Valve Schedule Frames: Glazed extruded aluminum display frame, with screws for removable mounting on masonry walls for each page of valve
   1. Glazing: ASTM C 1036, 2.5 mm, single thickness, sheet glass.
      a. Type: Type I, flat transparent.
      b. Class: Class 1, clear.
      c. Quality: Glazing B, for general applications.
M. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white (letter color) melamine sub core, except when other colors are indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.
   1. Engraved with engraver’s standard letter style, of sizes and with terms to match equipment identification.
   2. Thickness: 1/16 inch, for units up to 20 square inches or 8 inches length; 1/8 inch for larger units.
   3. Fasteners: Self-tapping stainless steel screws or contact-type permanent adhesive.
N. Plastic Equipment Markers: Laminated plastic, in the following color code:
   1. Green: Cooling equipment and components.
   2. Yellow: Heating equipment and components.
   3. Yellow/Green: Combination cooling and heating equipment and components.
   5. Blue: Equipment and components that do not meet any of above criteria.
   6. For hazardous equipment, use colors and designs recommended by ASME A13.1.
   7. Terminology: Include following, matching schedules as closely as possible:
      a. Name and plan number.
      b. Equipment service.
      c. Design capacity.
      d. Other design parameters such as pressure drop, entering and leaving conditions and rpm.
   8. Size: Approximate 2-1/2 by 4 inches for control devices, dampers and valves; and 4-1/2 by 6 inches for equipment.
O. Plasticized Tags: Pre-printed or partially pre-printed accident-prevention tags, of plasticized card stock with matt finish suitable for writing.
   2. Fasteners: Brass grommets and wire.
   3. Nomenclature: Large-size primary wording such as "DANGER," "CAUTION" or "DO NOT OPERATE."
P. Lettering and Graphics: Coordinate names, abbreviations and other designations used in mechanical identification, with corresponding designations indicated. Use numbers, letters, and terms indicated for proper identification, operation, and maintenance of mechanical systems and equipment.
   1. Multiple Systems: Where multiple systems of same name are indicated, identify individual system number as well as service (such as Boiler No. 3, Air Supply No. 1H or Standpipe F12.)

PART 3 - EXECUTION

3.1 LABELING AND IDENTIFYING
A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
   2. Plastic markers, with application systems. Install on pipe insulation segment where required for hot non-insulated pipes.
      a. Fasten markers on pipes smaller than 6 inches by one of following methods:
         1) Snap-on application of pre-tensioned semi-rigid plastic pipe marker.
         2) Adhesive lap joint in pipe marker overlap.
         3) Laminated or bonded application of pipe marker to pipe (or insulation).
         4) Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 3/4 inch wide, lapped 1-1/2 inches minimum at both ends of pipe marker, and covering full circumference of pipe.
      b. Fasten markers on pipes 6 inches and larger by one of following methods:
         1) Laminated or bonded application of pipe marker to pipe (or insulation).
         2) Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 1-1/2 inches wide, lapped 3 inches minimum at both ends of pipe marker and covering full circumference of pipe.
         3) Strapped to pipe (or insulation) with manufacturer's standard stainless steel bands.
   3. Locate pipe markers and color bands as follows wherever piping is exposed in finished spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.
      a. Near each valve and control device.
      b. Near each branch connection, excluding short take-offs for fixtures and terminal units. Mark each pipe at branch, where flow pattern is not obvious.
      c. Near penetrations through walls, floors, ceilings or enter non-accessible enclosures.
      d. At access doors, manholes and similar access points that permit view of concealed piping.
      e. Near major equipment items and other points of origination and termination.
      f. Spaced at a maximum of 50-feet intervals along each run. Reduce intervals to 25 feet in congested areas of piping and equipment.
      g. On piping above removable acoustical ceilings, except omit intermediate spaced markers.
B. Valve Tags: Install valve tag on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, plumbing fixture supply stops, shut-off valves, faucets, convenience and lawn-watering hose bibbs, and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in valve schedule.
   1. Install mounted valve schedule in each major equipment room.
C. Equipment: Install engraved plastic laminate signs or equipment markers on or near each major item of mechanical equipment. Provide signs for following general categories of equipment:
   1. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
   2. Meters, gages, thermometers and similar units.
3. Fuel-burning units including boilers, furnaces, heaters, stills and absorption units.
4. Pumps, compressors, chillers, condensers and similar motor-driven units.
5. Heat exchangers, coils, evaporators, cooling towers, heat recovery units and similar equipment.
6. Tanks and pressure vessels.
7. Strainers, filters, humidifiers, water treatment systems and similar equipment.

D. Optional Sign Types: Stenciled signs may be provided instead of engraved plastic, at Installer’s option, where lettering larger than 1-inch high is needed for proper identification because of distance from normal location of required identification.
1. Lettering Size: Minimum 1/4 inch for name of unit where viewing distance is less than 2 feet, 1/2 inch for distances up to 6 feet, and proportionately larger lettering for greater distances. Provide secondary lettering 2/3 to 3/4 of size of principal lettering.
2. Terms on Signs: In addition to name of identified unit distinguish between multiple units, indicate operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

E. Plasticized Tags: Install within concealed space to reduce amount of text in exposed sign (outside concealment), where equipment to be identified is concealed above acoustical ceiling or similar concealment.
1. Identify operational valves and similar minor equipment items located in unoccupied spaces (including machine rooms) by installing plasticized tags.

3.2 ADJUSTING AND CLEANING
A. Relocate mechanical identification materials and devices which have become visually blocked by work of this Division or other Divisions.

END OF SECTION
SECTION 23 0593
DUCT TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.
B. Section 230501 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 SUMMARY
A. Includes but not limited to
1. Test, balance and adjust air duct systems as described in Contract Documents

1.3 SYSTEM DESCRIPTION
A. Performance Requirements
1. The air distribution systems shall be balanced by a Balancing or Engineering Firm with five years’ experience in HVAC design and balancing. The report shall be stamped by a licensed engineer and certified by NEBB or AABC. The Balancing firm shall furnish the necessary instruments for making tests and performing work. The Mechanical Contractor shall include in his contract all costs including the Balancing Firm’s charges.
2. Noise level shall not exceed PNC 35 for all supply and return air outlets and inlets when all mechanical equipment is operating.

1.4 SUBMITTALS
A. Quality Assurance/Control
1. Four copies of complete test data for evaluation and approval.
2. Test and Balance Report
   a. Complete with logs, data, and records as required herein. Print logs, data and records on white bond paper bound together in report form.
   b. Certified accurate and complete by Balancing Agency’s certified test and balance engineer.
   c. Contain following general data in format selected by Balancing Agency.
      1) Project Number
      2) Project Title
      3) Project Location
      4) Project Architect and Mechanical Engineer
      5) Test and Balance Agency and Certified Engineer
      6) Contractor and mechanical sub-contractor
      7) dates tests were performed
      8) Certification Document
      9) Report forms similar to AABC standard format
   d. Report shall include following
      1) Preface suggesting abnormalities and problems encountered.
      2) Instrumentation list including type, model, manufacturer, serial number, and calibration dates.
      3) System Identification reporting location of VAV boxes, zones, supply, return and exhaust openings.
      4) Record following for each piece of air handling equipment.
         a) Manufacturer, model number and serial number.
         b) Design and manufacturer rated data.
         c) Actual CFM
         d) Suction and discharge static pressure of each fan.
         e) Outside-air and return-air total CFM
         f) Actual operating current, voltage, and brake horsepower of each fan motor.
         g) Final RPM of each motor.
         h) Fan and motor sheave manufacturer, model, size, number of grooves
and center distance.
  i) Belt size and quantity.
  j) Static-pressure controls final operating set points.

1.5 QUALITY ASSURANCE
A. Qualifications
1. Work of this Section shall be performed by independent Air Testing and Balance Agency specializing in testing and balancing of heating, ventilating, and cooling systems to balance, adjust and test air moving equipment, air distribution and exhaust systems.
2. Agency shall provide proof of having successfully completed at least five years of specialized experience in air and hydronic system balancing. Work by his agency shall be done under direct supervision of qualified heating and ventilating engineer employed by Agency.
3. Agency shall be approved in writing by Architect.
4. Neither Architect’s engineering consultant nor anyone performing work on this Project under other Sections of Division 23 shall be permitted to do this work.

1.6 SCHEDULING
A. Award test and balance subcontract to Agency upon receipt of Notice To Proceed to allow Agency to schedule this work in cooperation with other Sections involved and to comply with completion date.
B. During construction, Agency shall inspect installation of pipe systems, sheet metal work, temperature controls, and other component parts of mechanical systems, perform inspections as follows.
  1. One inspection when 60 percent of ductwork is installed
  2. One inspection when 90 percent of equipment is installed.
C. Do not begin air testing and balancing until
  1. After completion of air cooling, heating, and exhaust systems including installation of specialties, devices, and new filters.
  2. Proper function of control system components including electrical interlocks, damper sequences, air and water reset, and fire and freeze stats has been verified.
  3. Automatic temperature controls have been calibrated and set for design operating conditions.
  4. Verification of proper thermostat calibration and setting of control components such as static pressure controllers and other devices that may need set points changed during process of balancing system.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 TEST AND BALANCE COMPANIES
1. Environmental Engineers
2. Florite
3. Building System Technologies
4. Felthouse Balancing
5. Testing company shall submit experience and history 14 days before bid day for approval.

3.2 PREPARATION
A. Heating, ventilating, and cooling systems and equipment shall be in full operation and continue in operation during each working day of testing and balancing.

3.3 FIELD QUALITY CONTROL
A. Site Tests
  1. If requested, conduct tests in presence of Architect.
  2. Instruments used by Agency shall be accurately calibrated and maintained in good working order.
3. Air Testing And Balancing Procedure
   a. Perform tests at high and low speeds of multi-speed systems and single speed systems. Perform following testing and balancing functions in accordance with Associated Air Balance Council National Standards.
      1) Fan Speeds
         a) Air Handling Units (with variable pitch pulleys and sheaves) Test and adjust fan RPM to achieve design CFM requirements.
         b) Furnaces and Fan Coil Units (with direct drive motors) Set fan speed to lowest possible setting that will achieve design CFM requirements. Adjust down from Contractor setting, if necessary.
      2) Current And Voltage: Measure and record motor current and voltage
      3) Pitot-Tube Traverse: Perform pitot-tube traverse of main supply and return ducts to obtain total CFM
      4) Outside Air: test and adjust system minimum outside air by pitot-tube traverse.
      5) Static Pressure: Test and record system static pressures, including suction and discharge static pressure of each fan.
      6) Air Temperature: Take wet and dry bulb air temperatures on entering and leaving side of each cooling coil. Dry bulb temperatures shall be taken on entering and leaving side of each heating unit.
      7) Zone ducts: Adjust zone ducts to within design CFM requirements. At least one zone balancing damper shall be completely open.
      8) Main Ducts: Adjust main ducts to within design CFM requirements and traverse for total CFM quantities.
      9) Branch Ducts: Adjust branch ducts to within design Cfm requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.
     10) Tolerances: Test and balance each diffuser, grille, and register to within 10 percent of design requirements.
     11) Identification: Identify the location and area of each grille, diffuser, register and terminal box. Record on air outlet data sheets.
     12) Description: Record size, type, and manufacturer of each diffuser, grille and register on air outlet data sheets.
     13) Terminal Boxes: Set volume regulators on terminal boxes to meet design maximum and minimum CFM requirements. Check temperature controls for proper operation and calibration. Read out diffusers connected to terminal boxes shall be read out in heating and cooling modes and record their readings on air outlet data sheets.
     14) Drafts: Adjust diffusers, grilles and registers to minimize drafts.
   b. Permanently mark all outside air, supply air, and return air damper positions after balancing has been completed.

4. Smoke testing, or some other approved means, may be required to determine leak locations if air balance report indicates that any system’s CFM total is less than 10 percent of design CFM. Prior to test, verify that system’s duct joints have been sealed as specified and that air moving device in question is supplying required design system airflow. Architect will approve test method required. If smoke test is selected, use following procedure. Provide necessary precautions to protect those performing or observing test from being exposed to smoke.
   a. Use zinc chloride smoke candles, titanium tetrachloride ampules or sticks, or other devices acceptable to Architect to generate smoke.
   b. Close openings in duct except for one opening at farthest end of duct run.
   c. Circulate smoke at pressurized condition of ½ inch 13 mm minimum water gauge static pressure.
   d. Report findings to Architect in writing.

B. Final Inspection and Adjustments
   1. System shall be balanced and reports submitted to Architect before final inspection.
2. Balancing Agency shall be represented at final inspection meeting by qualified testing personnel with balancing equipment and two copies of air balancing test report.
   a. Architect will choose and direct spot balancing of one zone. Differences between the spot balance and test report will be justification for requiring repeat of testing and balancing for entire building. If recheck testing demonstrates measured flow deviation of 10 percent or more from recorded information on report, report will be rejected and new inspection and report will be made and resubmitted.
   b. Perform re-balancing in presence of Architect and subject to its approval.
   c. If re-balancing is required, submit revised air test and balance reports to architect before Substantial Completion.
   d. Spot balance and re-balance shall be performed at no additional cost to Owner.
3. Where furnace supplied to job site provides over 5 percent more air than schedule requirements, rooms supplied by that furnace shall have their supply air quantities increased by ratio of actual total air quantity supplied to minimum air quantity required by furnace schedule.

END OF SECTION
SECTION 23 0594
PIPE TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of contract, including General and Supplementary Conditions and Division-01 Specification sections, apply to work of this section.
B. Section 230501 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 SUMMARY
A. Include but not limited to
1. Testing, balancing, and adjusting of hot water heating system as described in Contract Documents.

1.3 SUBMITTALS
A. Quality Assurance/Control
1. Four copies of complete test data for evaluation and approval. Include neatly typed listing of items required by Contract Documents.
B. Closeout

1.4 QUALITY ASSURANCE
A. Qualifications
1. Procure services of an independent Testing and Balancing Agency that specializes in balancing and testing of similar systems to balance, adjust, and test water systems and equipment.
2. Agency shall provide proof of having successfully completed at least five projects of similar size and scope
3. Agency shall be approved in writing by Architect.
4. Work by Agency shall be performed under direct supervision of qualified Heating and Ventilating Engineer employed by Agency.
5. Neither Architect’s consulting engineer nor anyone designing work on this Project under Division 23 shall be permitted to do this work.

1.5 SEQUENCING
A. Award test and balance subcontract to approved agency upon receipt of Notice to Proceed to allow Agency to schedule this work in cooperation with work of other Sections involved and to comply with completion date.
B. Begin testing and balancing upon completion of cooling and heating systems including installation of specialties and devices.
C. Begin work of this Section after heating, ventilating, and cooling systems and equipment are in full operation and continue their operation during each working day of testing and balancing.

PART 2 - PRODUCTS
Not Used

PART 3 - EXECUTION

3.1 TEST AND BALANCE COMPANIES
1. Environmentsl Engineers
2. Florite
3. Building System Technologies
4. Felthouse Balancing
5. Testing company shall submit experience and history 14 days before bid day for approval.

3.2 FIELD QUALITY CONTROL

A. Site Tests

1. Instruments used by Agency shall be accurately calibrated and maintained in good working order.
2. Testing and Balance Agency shall provide technicians with following instruments for field use.
   a. One set of pressure gauges and fittings.
   b. Dry bulb thermometer.
   c. Wet bulb thermometer.
   d. Thermocouple unit and thermocouples.
   e. Set of balancing cock adjustment wrenches.
   f. Portable field flowmeter.
3. If requested, conduct tests in presence of Architect
4. Preparation of System: Phase I
   a. Open valves to full position including coil stop valves, close bypass valves, and return line balancing cocks.
   b. Remove and clean strainers.
   c. Examine water in system to determine if it has been treated and is clean.
   d. Check pump rotation.
   e. Check expansion tanks to make sure they are not air bound and system is full of water.
   f. Check air vents at high points of water systems to make sure they are installed properly and are operating freely. Make certain air is removed from circulating system.
   g. To balance coils, set system to call for full heating.
   h. Check operation of automatic bypass valve.
   i. Check and set operating temperature of boilers to design requirements.
   j. Perform air balance before beginning water balance.
5. Performance of Testing and Balancing: Phase II
   a. Set condenser water and hot water pumps to proper gpm delivery.
   b. Adjust flow of hot water through boilers and condensers.
   c. Check leaving water temperatures, return water temperatures, and pressure drop through boilers. Reset to correct design temperatures. Include condensers.
   d. Check water temperature at inlet side of heating coils. Note rise or drop of temperatures from source.
   e. Balance each hot water coil.
   f. Upon completion of flow readings and coil adjustments, mark settings and record data.
6. Performance of Testing and Balancing: Phase III
   a. After making adjustments to coils, recheck settings at pumps and boilers. Read just if required.
   b. Install pressure gauges on each coil, and then read pressure drop through coil at set flow rate on call for full heating. Set pressure drop across bypass valve to match coil full blow pressure drop. This prevents unbalanced flow conditions when coils are on full bypass.
   c. Check and record the following items at each heating element.
      1) Inlet water and air temperatures.
      2) Leaving water and air temperatures.
      3) Pressure drop of each coil.
      4) Pressure drop across bypass valve.
      5) Pump operating suction and discharge pressures and final TDH.
      6) Mechanical specifications of pumps.
      7) Rated and actual running amperage of pump motor.

END OF SECTION
SECTION 23 0713
DUCTWORK INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.
B. Section 230501 - Basic Mechanical Materials and Methods sections apply to work of this section.
C. Section 230713 - Acoustical insulation inside air ducts.

1.2 SUMMARY
A. Includes But Not Limited To
1. Furnish and install insulation on air ducts outside building insulation envelope as described in Contract Documents.
2. Furnish and install insulation on supply, exhaust, return, and fresh air ducts and combustion air ducts within building insulation envelope.
3. Furnish and install insulation on other air ducts where indicated on Drawings.

PART 2 - PRODUCTS

2.1 INSULATION
A. 1 inch thick fiberglass with aluminum foil scrim kraft facing and have a density of one lb/cu ft. (R-Value = 4.2) for inside building envelope.
B. 2 inch thick fiberglass with aluminum foil scrim kraft facing and have a density of 1.5 lb/cu ft. (R-Value = 8.0) for outside building envelope
C. Approved Manufacturers.
   1. Manville Microlite FSK
   2. CSG Type IV standard duct insulation
   3. Owens-Corning FRK
   4. Knauf (Duct Wrap FSK)
   5. Certaintred Standard

PART 3 - EXECUTION

3.1 INSTALLATION
A. Install duct wrap in accordance with Manufacturer's recommendations (overlap insulation 4-inches).
B. Do not compress insulation except in areas of structural interference.
C. Completely seal joints.

END OF SECTION
SECTION 23 0714
HYDRONIC PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of contract, including General and Supplementary Conditions and Division-01 Specification sections, apply to work of this section.
B. Section 230501 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 SUMMARY
A. Includes But Not Limited To
1. Furnish and install insulation on above ground heating and chilled water lines, fittings, valves, and accessories as described in Contract Documents.

PART 2 - PRODUCTS

2.1 INSULATION
A. 1 ½" or 2" Heavy density pipe insulation (R-3) with factory vapor jacket equal to Fiberglas ASJ may be used. (R-3.7 per inch)

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Insulation Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>½&quot; - 1 ½&quot;</td>
<td>1 ½&quot; Thick</td>
</tr>
<tr>
<td>1 ½&quot; - Greater</td>
<td>2&quot; Thick</td>
</tr>
</tbody>
</table>
B. Approved Manufacturers
1. Manville
2. Owens-Corning
3. Knauf

2.2 PVC FITTING, VALVE, & ACCESSORY COVERS
A. Approved Manufacturers
1. Knauf
2. Zeston

PART 3 - EXECUTION

3.1 APPLICATION
A. Piping
1. Apply insulation to clean, dry piping with joints tightly butted.
2. Adhere "factory applied vapor barrier jacket lap" smoothly and securely at longitudinal laps with a white vapor barrier adhesive.
3. Adhere 3 inch wide self-sealing butt joint strips over end joints.
B. Fittings, Valves, & Accessories
1. Insulate with same type and thickness of insulation as pipe, with ends of insulation tucked snugly into throat of fitting and edges adjacent to pipe insulation tufted and tucked in.
2. Cover insulation with one piece fitting cover secured by stapling or taping ends to adjacent pipe covering.
3. Alternate Method
   a. Insulate fittings, valves, and accessories with one inch of insulating cement and vapor seal with two 1/8 inch wet coats of vapor barrier mastic reinforced with glass fabric extending 2 inches onto adjacent insulation.
C. Pipe Hangers
1. Do not allow pipes to come in contact with hangers.
2. Provide 16 ga x 6 inch long galvanized shields at each pipe hanger to protect pipe insulation from crushing by clevis hanger.
D. No insulation shall be applied until piping has been pressure tested and approved.
E. In all cold attic situations where the building insulation is located at the ceiling, all piping installed in the ceiling to roof space shall be insulated as specified herein. In addition, install at 6" thick by 30" wide fiberglass blanket with vapor barrier (vapor barrier towards warm side of cavity) over the pipe to tent and allow heat loss through the ceiling to prevent the pipe from freezing. The insulation blanket shall be held in place by rolling it to a wood lathe and nailed to the joist. The building insulation shall then be applied over this pipe protection layer.
F. In room installations where excess moisture or humidity will be present, only the polyolefin or elastomeric insulation shall be used.

END OF SECTION
SECTION 23 0800
COMMISSIONING OF HVAC

PART 1 – GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of contract, including General and Supplementary Conditions and other Division-01 Specification Sections, apply to work of this section.

1.2 SUMMARY
A. Section in includes commissioning process requirements for HVAC&R systems, assemblies, and equipment.
B. Related Sections:
   1. Division 01 Section “General Commissioning Requirements” for general commissioning process requirements.

1.3 DEFINITIONS
A. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.
B. CxA: Commissioning Authority.
D. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean “as-built” systems, subsystems, equipment, and components.

1.4 INFORMATIONAL SUBMITTALS
A. Certificates of readiness
B. Certificates of completion and installation, prestart, and start up activities.

1.5 ALLOWANCES
A. Labor, instrumentation, tools, and equipment costs for technicians for the performance of commissioning testing are covered by the “Schedule of Allowances” Article in Division 01 Section “Allowances.”

1.6 UNIT PRICES
A. Commissioning testing allowance may be adjusted up or down by the :List of Unit Prices” Article in Division 01 Section "Unit Prices" when actual man-hours are computed at the end of commissioning testing.

1.7 CONTRACTOR’S RESPONSIBILITIES
A. Perform commissioning tests at the direction of the Engineer.
B. Attend construction phase controls coordination meeting.
C. Attend testing, adjusting, and balancing review and coordination meeting.
D. Participate in HVAC & R systems, assemblies, equipment, and component maintenance orientation and inspection as directed by Engineer.
E. Provide information requested by Engineer for final commissioning documentation.
F. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.

1.8 COMMISSIONING OF DOCUMENTATION
A. Provide the following information to Engineer for inclusion in the commissioning plan:
   1. Plan for delivery and review of submittals, systems manuals, and other documents and reports.
   2. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.
   3. Process and schedule for completing construction checklists and manufacturer’s prestart and startup checklists for HVAC & R systems, assemblies, equipment, and components to be verified and tested.
   4. Certificate of completion certifying that installation, prestart checks, and startup procedures have been completed.
   5. Certificate of readiness certifying that HVAC & R systems, subsystems, equipment, and associated controls are ready for testing.
   6. Test and inspection reports and certificates.
7. Corrective action documents.
8. Verification of testing, adjusting, and balancing reports.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TESTING PREPARATION
A. Certify that HVAC & R systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.
B. Certify that HVAC & R instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.
C. Certify that testing, adjusting, and balancing procedures have been completed and that testing, adjusting, and balancing reports have been submitted, discrepancies corrected, and corrective work approved.
D. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
E. Inspect and verify the position of each device and interlock identified on checklists.
F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.
G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by Engineer.

3.2 TESTING AND BALANCING VERIFICATION
A. Prior to performance of testing and balancing work, provide copies of reports, sample forms, checklists, and certificates to Engineer.
B. Notify Engineer at least 10 days in advance of testing and balancing work, and provide access for Engineer to witness testing and balancing work.
C. Provide technicians, instrumentation, and tools to verify testing and balancing of HVAC&R systems at the direction of Engineer.
   1. Engineer will notify testing and balancing contractor 10 days in advance of the date of the field verification. Notice will not include data points to be verified.
   2. The testing and balancing contractor shall use the same instruments (by model and serial number) that were used when original data was collected.
   3. Failure of an item includes, other than sound, a deviation of more that 10 percent. Failure of more than 10 percent of selected items shall result in rejection of final testing, adjusting and balancing report. For sound pressure readings, a deviation of 3 dB shall result in rejection of final testing. Variations in background noise must be considered.
   4. Remedy the deficiency and notify Engineer so verification of failed portions can be performed.

3.3 GENERAL TESTING REQUIREMENTS
A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the engineer.
B. Scope of HVAC & R testing shall include entire HVAC & R installation, from central equipment for heat generation and refrigeration through distribution systems to each conditioned space. Testing shall include measuring capacities and effectiveness of operational and control functions.
C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.
D. Engineer along with the HVAC & R subcontractor, testing and balancing subcontractor, and HVAC & R instrumentation and control subcontractor, shall prepare detailed testing plans, procedures, and checklists for HVAC & R systems, subsystems, and equipment.
E. Tests will be performed using design conditions whenever possible.
F. Simulated condition may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by engineer and document simulated conditions and methods of simulation. After test, return settings to normal operating conditions.

G. Engineer may direct that set points be altered when simulating conditions is not practical.

H. Engineer may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

I. If tests cannot be completed because of a deficiency outside the scope of the HVAC & R system, document the deficiency and report it to the engineer. After deficiencies are resolved, reschedule tests.

J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.4 HVAC & R SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

A. Boiler Testing and Acceptance Procedures: Testing requirements are specified in Division 23 boiler sections. Provide submittal, test data, inspector record, and boiler certification to engineer.

B. HVAC & R Instrumentation and Control System Testing: Field testing plans and testing requirements are specified in Division 23 Sections “Instrumentation and Control for HVAC” and “Sequence of Operations for HVAC Controls.” Assist engineer with preparation of testing plans.

C. Pipe system cleaning, flushing, hydrostatic tests and chemical treatment requirements are specified in Division 23 piping sections. HVAC & R subcontractor shall prepare a pipe system cleaning, flushing, and hydrostatic testing plan. Provide cleaning, flushing, testing, and treating plan and final report to engineer. Plan shall include the following:

1. Sequence of testing and testing procedures for each section of pipe to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed to drawings for each pipe sector, showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be physically located and identified when referred to in pipe system cleaning, flushing, hydrostatic testing, and chemical treatment plan.

2. Description of equipment for flushing operations.


4. Tracking checklist for managing and ensuring that all pipe sections have been cleaned, flushed, hydrostatically tested, and chemically treated.

D. Refrigeration System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of chillers, cooling towers, refrigerant compressors and condensers, heat pumps, and other refrigeration systems. Engineer shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested.

E. HVAC & R Distribution System of Testing: Provide technicians, instrumentation, tools, and equipment to test performance of air, steam, and hydronic distribution systems; special exhaust; and other distribution systems, including HVAC & R terminal equipment and unitary equipment.

F. Vibration and Sound Tests: Provide technicians, instrumentation, tools, and equipment to test performance of vibration isolation and seismic controls.

END OF SECTION
SECTION 23 0933
CONTROL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of contract, including General and Supplementary Conditions and Division-01 Specification sections, apply to work of this section.
B. Section 230501 Basic Mechanical Materials and Methods sections apply to work of this section.
C. Section 230933 - Furnishing and installing of temperature control dampers.
D. Division 26 - Furnishing and installing of raceway (conduit) and junction boxes, including pull wires, for temperature control system except as noted above.
E. Division 26 - Power wiring to magnetic starters, disconnect switches, and motors.
F. Division 26 - Motor starters and disconnect switches, unless integral with packaged equipment.

1.2 SUMMARY
A. Includes But Not Limited To
1. Furnish and install automatic temperature control system as described in Contract Documents.
2. Furnish and install conductors and make connections to control devices and equipment. Furnish and install exposed raceway (conduit) in Mechanical Rooms.
3. Calibrate, adjust, and set controls for proper operation, operate systems and be prepared to prove operation of any part of control system. This work is to be completed before pre-final inspection.

1.3 SYSTEM DESCRIPTION
A. Design Criteria
1. Install line and low voltage electrical wiring, raceway (conduit), and boxes in accordance with Division 26 of these Specifications.
2. System controls shall be single manufacturer's products.

1.4 SUBMITTALS
A. Shop Drawings
1. Provide three copies of shop drawing submittal data for review. See Section 230501 for definitions and procedures.
B. Operation & Maintenance Data
1. Upon completion of work of this Section and prior to final inspection, provide two copies of "as-built" ATC diagrams, schematics, catalog cuts, maintenance instructions, and written operating sequence for each furnace/fan system to be included in Operation & Maintenance Manual specified in Section 230501.

PART 2 - PRODUCTS

2.1 THERMOSTATS AND DAMPERS
A. Programmable low voltage type provided with automatic change over feature for both heating and ventilating stages, seven day program with one start and stop per day with three hour override, and provisions for damper operators.
B. Thermostats to be horizontally mounted.
C. Approved Thermostat Models
1. Tekmar or Taco
2. All others by prior approval.

2.2 CONDUCTORS
A. Color coded and #16 AWG Type TFN or THHN.
PART 3 - EXECUTION

3.1 INSTALLATION
   A. Run all wiring in conduit.
   B. Mount Room Thermostats 4'0" from floor to center of thermostat.
   C. Mount damper actuators and actuator linkages external of air flow.
   D. Provide fresh battery in each thermostat (Mallory MN1604 9 volt alkaline type or equal) and instruct custodian in battery replacement.

3.2 FIELD QUALITY CONTROL
   A. Field Service
      1. Calibrate, adjust and set controls for proper operation, operate systems and be prepared to prove operation of any part of control system. This work is to be completed before prefinal inspection.

3.3 ADJUSTING, CLEANING
   A. Remove unused wire and conduit from site and test system's controls for two days.

END OF SECTION
SECTION 23 2113
HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Drawings and general provisions of contract, including General and Supplementary Conditions and Division-01 Specification sections, apply to work of this section.
   B. Section 230501 Basic Mechanical Materials and Methods sections apply to work of this section.
   C. Refer to Section 230714
   D. Refer to Section 230715
   E. Division 26 - Electrical service and connections.

1.2 SUMMARY
   A. Includes But Not Limited To
      1. Furnish and install hydronic piping and specialties as described in Contract Documents.
      2. All materials and equipment specified under this section shall be American manufactured and made.

1.3 REFERENCES
   A. American National Standards Institute/American Society for Mechanical Engineers

PART 2 - PRODUCTS

2.1 COMPONENTS
   A. Pipe
      1. Use one of following pipe systems
         a. Type L hard drawn copper tube.
         d. Wirsbo he PEX tubing or Rehau Raupex O2 tubing.
         e. Viega, LLC ViegaPEx Barrier or Viega FostaPEx with oxygen diffusion barrier.
   B. Fittings
      2. 2 Inch & Smaller - 150 psi malleable iron screwed type
      4. Wirsbo Propex or Rehau Everlock fittings.
      5. Viega PEX Press or SVC fittings.
   C. Connections
      1. Copper
         a. Brazing Rods
            1) Copper to Copper Connections
            2) AWS Classification BCuP-4 Copper Phosphorus (6 percent silver).
            3) AWS Classification BCuP-5 Copper Phosphorus (15 percent silver).
            4) Copper to Brass Connections - AWS Classification BAG-5 Silver (45 percent silver).
            5) Do not use rods containing Cadmium.
         b. Press-seal fittings:
            1) Bronze or copper shall conform to the material requirements of ASME B16.18 or ASME B16.22 and the performance requirement of IAPMO PS117 and ICC/ANSI LC1002 and NSF/ANSI 61-pw. Press-seal fittings 1/2-inch thru 4-inch for use with ASTM B88 copper tube shall have an EPDM sealing element, and an un-pressed fitting leak identification feature. 2-1/2-inch thru 4-inch shall have a 420 stainless grip ring, PBT separator ring, and EPDM sealing element. Sealing elements shall be verified for the intended use.
      2. Flux
         a. Approved Manufacturers
         b. Stay-Silv White Brazing Flux by J W Harris Co
         c. High quality silver solder flux by Handy & Harmon
4. PEX Piping
   a. Pro PEX rings.
   b. Compression fittings
   c. Everloc sleeves.
   d. Viega PEX press fittings or SVC fittings

5. Flex Hose
   a. Pipe 3/4” flex hose to each VAV box. Provide EVCO Stainless Braided Flex with oxygen barrier to each box.

D. Cocks
1. Gauge Cocks
   a. Brass Tee handle
   b. Approved Manufacturers
      1) Ashcroft - 1092
      2) Ernst - 123
      3) Ttreice - 865
      4) Walworth - 557
      5) Equal by Marsh, Powell, or Weksler.
   c. Balancing Cocks - Use a specified ball valve.

E. Ball Valves
1. Butterfly Valves
   a. Operable in any quadrant, shall operate properly with flow in either direction, and fully suitable for throttling and tight shut-off service.
   b. Pressure drops at valve flows shall not exceed that for Centerline valves.
   c. 150 psi working pressure and -40 to 275 F.
   d. Body - Ductile iron lug-wafer type with lugs tapped on both sides.
   e. Seat - EPT Nordel, rubber lined.
   f. stem
      1) 304 or 316 stainless steel.
      2) Diameter not to be reduced at bearings.
   g. Disc - Bronze or NDI (nylon coated ductile iron), bubble tight at 150 psig.
   h. Bushings
      1) Reinforced Teflon, nylon, or oilite.
      2) Provide bearings at both ends of stems.
   i. Operating Mechanisms - Infinite throttling handle with provision for locking in any position and with position stop.
   j. Approved Manufacturers
      1) Bray - Series 30
      2) Centerline - Series 200
      3) Crane - "Monarch" Series
      4) Gustin Bacon - 303
      5) Milwaukee - ML233E
      6) Norris/O'Bannon - R Series
      7) Pratt - Model 2FII
      8) Victaulic - Series 300
      9) Watts BF-03

2. Check Valves
   a. Swing check valves
      1) Provision for re-grinding without removal of the valve from the line.
      2) 2 Inch and Smaller - All bronze, 125 psi swp at 350 F.
      3) 2 ½ inch and larger - Flanged iron body, bronze mounted 125 psig swp at 450 F.
      4) Approved Manufacturers
         a) 2 inch and smaller - Stockham B319, Milwaukee 509-T
         b) 2 ½ inch and larger - Stockham G931, Milwaukee F2974
         c) Equals by Crane, Jenkins, Lunkenheimer, Victaulic, or Walworth.
   b. Non-Slam check valves
      1) Silent, spring loaded
2) 125 psi swp
3) Silent, semi-steel body.
4) Bronze trim and discs
5) Bronze seats with center guide and renewable with reseating with special tools.
6) Guided spring
7) Operate in horizontal, vertical, angular, or upside down position.
8) Approved Manufacturers
   a) Bell & Gossett ITT or equal by
   b) Milwaukee
   c) Mueller
   d) Nibco Inc
   e) Victaulic Series 716

3. Ball Valves
   a. Designed for shut off service
   b. High temperature service type rated at 150 lb steam working pressure and 350°F maximum temperature.
   c. Three piece swing out bronze body construction with full port, screwed end connections, and Teflon seats.
   d. Provide extended stem on insulated line.
   e. Approved Manufacturers
      1) ConBraCo - Apollo - 82-100
      2) Gustin Bacon - 305
      3) Hammond - BV 811T
      4) Milwaukee - BA-300
      5) Nibco - T595-Y
      6) Victaulic - Series 721
      7) Watts - B6600

F. Circulator Pumps
   1. Rated for 125 psi maximum working pressure and 225 deg F maximum operating seal temperature.
   2. In-line centrifugal type with cast iron body, bronze impeller, carbon seals, flexible coupling, flanged connections, and quiet operating, ring mounted motor.
   3. Motor - 1750 rpm maximum with 120 volt, single phase, 60 Hertz electrical connections and built-in overload protection.
   4. Approved Manufacturers & Models -
      a. Bell & Gossett - One inch PR
      b. Grundfos
      c. Taco

G. Manual Air Vent Ball Valve
   1. Designed for use as a high point vent.
      a. Rated for 150 lb working pressure water, oil, gas, and steam.
      b. Bronze body with solder end connections, teflon stem & seats, and bubble tight shut off. 3/8" size with tee handle.
      c. Approved Manufacturers & Models -
         1) ConBraCo Apollo - 70-200
         2) Crane Gem - 2180 E
         3) Hammond - 806
         4) Jenkins - 1100T
         5) Nibco - S580
         6) Red & White - 5019 Gauges

H. Circuit Balancing Valves & Ventures
   1. Function capability of flow measurement.
   2. Flow balancing.
   3. Positive shut off.
   4. Valves shall have two scales:
      a. One for pre-setting valve.
      b. One for determining the flow rate during actual balancing.
5. Provide provisions for connecting differential pressure meter.
   a. Each meter connection shall have shut off valves.
   b. Include tamper proof and memory features.
   c. 2 Inch & Smaller
      1) Approved Manufacturers & Models
         a) CBV by Armstrong
         b) Circuit Setter Plus by Bell & Gossett
         c) Circuit Setter by TACO

I. Air Separation Tanks
1. Designed and certified to effectively separate dissolved air to .4% entrained air.
2. Air separation shall be affected by means of reduced water velocity within vessel (4 ft measure at 1 foot drop).
3. Separated air shall be continuously vented to atmosphere.
4. Constructed, tested, and stamped in accordance with ASME Code for Unfired Pressure Vessels for working pressure of 125 psig or 150% of system operating pressure, whichever is greater.
5. Separators shall not have strainers.
6. Approved Manufacturers
   a. Spirovent
   b. B & G
   c. Taco

J. Gauges
1. Thermometers
   a. Nine (9) inch adjustable, angle, red reading, mercury type with cast aluminum case and 3-1/2 inch chrome-plated brass separable socket.
   b. Range - 30 to 240 deg F.
   c. Approved Manufacturers:
      1) Trerice BX9 or equal by
      2) H-B
      3) Palmer
      4) Taylor
      5) Weiss
      6) Weksler
2. Pressure Gauges -
   a. 304 stainless, liquid filled, satin finished, stem-mounted flangeless case.
   b. 304 stainless plated ring
   c. Laminated safety glass window
   d. Bronze tube, brass socket.
   e. ½ percent scale range accuracy
   f. 4-1/2 inch diameter dial face
   g. Pressure Ranges
      1) Suit service intended.
      2) High pressure limit of gauges - Approximately 200 percent of expected maximum pressure at gauge location.
      3) Gauges at pump suction - 0 psig to 100 psig.
      4) Other gauges - Have low pressure limit of 0 psig.
   h. Approved Manufacturers:
      1) Trerice #700LFB or equal by
      2) Crosby-Ashton
      3) Marsh
      4) Weiss
      5) Weksler

K. Pump Strainer
1. Cast iron angle type body.
2. Fine mesh start-up disposable strainer.
4. Removable magnetic insert.
5. Adjustable support foot
6. Approved Manufacturers
   a. Armstrong
   b. Bell & Gossett
   c. TACO

L. Glycol Solution
   1. Chilled and Hot Water Systems shall be charged with propylene glycol. Solution shall be rated for -20°F.
   2. Manufacturer
      a. Dow Frost

PART 3 - EXECUTION

3.1 INSTALLATION
   A. Piping
      1. Use either steel or copper pipe and fittings, but not both.
      2. Use Teflon tape and pipe dope for lubricating threads on all threaded connections. To join copper pipes, apply flux, heat joints to remove excess flux & solder, and cool joints in accordance with Manufacturer’s recommendations.
      3. Install unions on downstream side of shut-off valves and specialty valves & meters, and on both sides of coils, baseboard units, and other heating equipment. Also install unions on both ends of radiation piping where piping goes from floor level into steel pipe troughs in floor slab.
      4. Anchor or hang piping so pipe weight does not rest on flexible connectors.
      5. Install Victaulic systems in accordance with Manufacturer’s requirements.
      6. Press-seal joint shall be installed using the most current edition of the manufacturer’s installation guidelines.

   B. Specialties
      1. Provide pressure snubbers on pump gauges.
      2. Connect to pipe with 1/4 inch connections utilizing cocks.

   C. Labels
      1. Label valves, pumps, flow meters, and other equipment items with equipment mark number shown on Drawings or with space served. (Gym, Auditorium, etc.)
      2. Label head/feet and flow gpm for pumps.
      3. Label flow gpm for flow meters.
      4. Labels shall be 2” x 3” laminated plastic, black with white engraved letters, and attached with brass, beaded chain.

3.2 FIELD QUALITY CONTROL
   A. Site Tests
      1. Conduct tests in presence of Architect and before piping is covered.
      2. Without connecting equipment items rated below 100 psi, pressure test system at 100 psi for two (2) hours. Correct leaks and defective work and repeat test until no leaks appear.
      3. After press-seal fittings have been installed a “step-test” shall be followed. Utilizing air, water or dry nitrogen, pressurize the system not to exceed 85 psi. Walk the system and check for leaks. If you do not locate any leaks proceed to pressurize the system to the recommended pressures, not to exceed 600 psi. Should you locate a leaking joint that has not been pressed, relieve the pressure from the system, insure the tube is fully inserted into the fitting and proceed to press the fitting. Should you locate a fitting that is leaking that has been previously pressed, you can press the fitting a second time. Resume test procedure, after the necessary repairs have been made.
SECTION 23 2115
RADIANT HEATING HYDRONIC PIPING

PART – 1 GENERAL

1.1 SUMMARY
A. Radiant heating systems, where shown on the Drawings and Schedules, shall be hydronic, and shall include the following:
   1. Crosslinked polyethylene (PEXa) piping.
   2. Distribution manifold(s) with balancing and flow control valves where required.
   3. Pipe-to-manifold compression nut fittings.
   5. Pipe fasteners as approved by the manufacturer of the PEXa piping.
   6. Controls.
   7. Supervision and field engineering required for the complete and proper function of the system.

1.2 RELATED SECTIONS
A. Section 03 30 00 – Cast-in-Place Concrete

1.3 REFERENCES
A. Publications listed here are part of this specification to the extent they are referenced. Where no specific edition of the standard or publication is identified, the current edition shall apply.
   B. ASTM – American Society for Testing and Materials
      2. ASTM F876, Standard Specification for Crosslinked Polyethylene (PEX) Tubing
      5. ASTM F2080, Standard Specification for Cold-Expansion Fittings With Metal Compression-Sleeves for Cross-Linked Polyethylene (PEX) Pipe
      6. All materials and equipment specified under this section shall be American manufactured and made.
   C. IAPMO – International Association of Plumbing and Mechanical Officials
   D. ICC – International Code Council
   E. ISO – International Organization for Standardization
      1. ISO 9001, Quality Management Systems – Requirements
   F. UL – Underwriters’ Laboratories of Canada
      1. CAN/ULC S102.2, Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials
   G. PPI – Plastic Pipe Institute
      1. PPI TR-3 / 2007, Policies and Procedures for Developing Hydrostatic Design Basis (HDB), Pressure Design Basis (PDB), Strength Design Basis (SDB), and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe

1.4 DEFINITIONS
A. Crosslinked polyethylene, commonly abbreviated PEX, is made from high density polyethylene (HDPE). Crosslinking is accomplished during manufacturing. Crosslinking enhances the physical & mechanical properties of the polymer. The high-temperature properties are improved. Chemical resistance is enhanced by resisting dissolution. Low temperature properties are also improved; its impact and tensile strength, scratch resistance, and resistance to brittle fracture are enhanced. The required degree of crosslinking, according to ASTM Standard F876, is between 70-89%. This specification requires PEX to be designated as PEXa and be manufactured by the high-pressure peroxide method.
1.5 SUBMITTALS
   A. Comply with Section 01 33 00, Submittal Procedures. Approval and/or acceptance of all submittals is required prior to fabrication.
      1. Submit manufacturer's instructions for installation.
      2. Submit data for equipment, fittings, fasteners and associated items necessary for the installation of the piping and manifolds.
   C. Submit computer-generated radiant heating system design indicating heat flux, pipe sizing, spacing, flow rates and temperatures. Design calculations shall be performed on pipe manufacturer's software or equivalent.
   D. Shop Drawings: Provide plans drawn to scale for all installation areas.
      1. Indicate dimensions, descriptions of materials, general construction, component connections, anchorage methods and installation procedures.
      2. Indicate design, schematic layout of system, including equipment, critical dimensions and piping/slab penetration details as well as details for protecting exposed PEX piping.
   E. Certification
      1. Submit independent certification results for the piping systems from an accredited independent testing laboratory.
      2. The design shall be approved by a professional appropriately licensed in the jurisdiction where the installation will take place, as being complete and accurate.
      3. Fittings shall be third-party certified to applicable referenced standards as part of the manufacturer’s PEX piping system, with independent listings from NSF, CSA and ICC, as applicable.
      4. Fittings embedded within the thermal mass or encased behind walls or ceilings shall be certified to ASTM F2080.
   F. Maintenance Instructions: Submit instructions for any maintenance required or recommended by manufacturer.

1.6 QUALITY ASSURANCE
   A. Comply with Section 01 43 00, Quality Assurance.
   B. Manufacturer: Must be a company specializing in the Work of this Section with a minimum of 5 years documented experience.
   C. All components shall be supplied by one manufacturer.
   D. Pipe shall be manufactured in a facility whose quality management system is ISO 9001 certified.
   E. Cross-linked polyethylene (PEXa) pipe shall conform and be certified to ASTM F876, F877 and CSA B137.5. Fittings shall conform and be certified to ASTM F877 or F2080, and CSA B137.5. Pipes with an oxygen diffusion barrier shall conform to the requirements for oxygen permeability DIN 4726 and shall also have the PPI TR-3 listing.

1.7 DELIVERY, STORAGE, AND HANDLING
   A. Comply with Section 01 60 00, Product Requirements.
   B. Deliver and store piping and equipment in shipping containers with labeling in place.
      1. Pipe shall be kept in original shipping boxes until required for installation.
   C. Store piping and equipment in a safe place, dry, enclosed, under cover, in a well-ventilated area.
      1. Do not expose pipe to ultraviolet light beyond exposure limits recommended by manufacturer.
      2. Protect piping and manifolds from entry of contaminating materials. Install suitable plugs in open pipe ends until installation.
      3. Where possible, connect pipes to assembled manifolds to eliminate possibility of contaminants and cross-connections.
      4. Piping shall not be dragged across the ground or other surfaces, and shall be stored on a flat surface with no sharp edges.
   D. Protect materials from damage by other trades.
   E. Pipe shall be protected from oil, grease, paint, direct sunlight and other elements as recommended by manufacturer.
1.8 WARRANTY
A. Provide manufacturer’s standard written warranty.
   1. The warranty shall include as a minimum, provisions to repair defects from faulty materials or workmanship developed during the guarantee period, or provide for replacement with new materials, at no expense to Owner.
   2. The radiant heating pipe manufacturer shall warrant the cross-linked polyethylene piping to be free from defects in material and workmanship for a period of twenty-five (25) years.
   3. Cold-expansion compression-sleeve fittings shall be warranted to be free from defects in material and workmanship for a period of twenty-five (25) years.
   4. All manifolds, distribution headers, thermostats and actuators shall be warranted to be free from defects in material and workmanship for a period of one (1) years starting at completion of successful pressurized water tests immediately following system installation.
B. Provide installer’s guarantee as appropriate.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER
A. REHAU, 1501 Edwards Ferry Road, NE; Leesburg, VA 20176; email: rehau.mailbox@rehau.com; website: www.rehau.com; upon whose products and equipment these specifications are based.
C. No Substitutions allowed.

2.2 PIPING
A. All radiant heating pipe shall be high-density crosslinked polyethylene manufactured using the high-pressure peroxide method of crosslinking (PEXa). Pipe shall conform to ASTM F876, ASTM F877 and CSA B137.5.
B. Pipe shall be rated for continuous operation of 100 psi gauge pressure at 180°F temperature (690 kPa @ 82°C), and 80 psi gauge pressure at 200°F temperature (550 kPa @ 93°C).
C. When required, pipe shall have a co-extruded oxygen diffusion barrier capable of limiting oxygen diffusion through the pipe to less than 0.32 mg/(m²/d) @ 104°F (40°C) water temperature, in accordance with DIN 4726.
D. Bend Radius
   1. The minimum bend radius for cold bending of the pipe shall be not less than five (5) times the outside diameter.
   2. Bends with a radius less than this shall require the use of a bending template as supplied by the pipe manufacturer, and/or hot air.
E. Pipe to have a Flame Spread Index of less than 25, and a Smoke Developed Index of less than 50 when tested in accordance with ASTM E84 (in U.S.) or CAN/ULC S102.2 (in Canada). In any case where the pipe does not conform to these standards, appropriate piping insulation shall be installed in order to meet the standard.

2.3 FITTINGS
A. Fittings shall be third-party certified to applicable standards ASTM F877, ASTM F2080 and CSA B137.5 as part of the manufacturer’s PEX piping system, with independent listings from IAPMO, NSF, CSA and ICC, as applicable.
B. Compression nut manifold fittings shall be manufactured of corrosion-resistant brass with a barbed insert and a reusable split compression ring.
C. Compression-sleeve fittings shall be manufactured of brass and shall be supplied by the piping manufacturer as part of a proven cataloged system.
D. Fittings embedded within the thermal mass or encased behind walls or ceilings shall be cold-expansion compression-sleeve fittings certified to ASTM F2080. Where required by the manufacturer, fittings shall be protected from external environmental conditions.

2.4 MANIFOLDS
A. Material: Distribution manifolds shall be manufactured of brass or copper and be supplied by the piping manufacturer as a proven cataloged part of the manufacturer’s system.
B. Brass manifolds shall be produced from extruded brass round pipe with tapped holes for connections, and be pre-assembled by the manufacturer. 100% of manifolds used shall have been air tested by the manufacturer with no indication of leaks.

C. Balancing Manifolds
   1. Where required by design, brass balancing manifolds shall be equipped with integral visual flow gauges, circuit balancing and flow control valves, isolation valves with integral thermometer housings, and air vent/fill ports.
   2. Each circuit valve shall be supplied with a manual actuating handle for filling/purging operation.

D. Copper Manifolds
   1. Copper manifolds shall be manufactured from Type L copper.
   2. Copper and/or brass outlets shall be high-temperature brazed (lead-free) into headers.
   3. Outlets in copper headers shall be made using the T-drill process according to ASTM F2014.

2.5 CONTROLS
   A. Room thermostats shall be low-voltage devices with electronic temperature sensing, and shall be supplied by the control contractor as part of a radiant system.
   B. Circuit actuators shall be low-voltage thermo-electric design for actuation of valves at the pump and manifold with visual indication of position, and built-in end switches, and shall be supplied by the control contractor as part of the radiant system.
   C. Note to Specifier: There are several control strategies that may apply to your specific project. You should consider your requirements and add control specifications to this section as required. Electronic Weather Compensating Mixing controls are recommended, as these match water supply temperature to heat loss, based on outdoor air temperature. Your local REHAU Technical Associate or regional Sales Office can assist with design and specification of a control system. Please be aware of the need, in some cases, to regulate the supply water temperature to the radiant heating system so as not to exceed limits of flooring materials.

PART 3 - EXECUTION

3.1 ACCEPTABLE INSTALLERS
   A. As a minimum, installation shall be performed by qualified laborers trained by the manufacturer in the procedures of PEX radiant heating systems and they shall be appropriately licensed for the jurisdiction where the installation will take place.

3.2 EXAMINATION
   A. Examine areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of Work. Do not proceed until unsatisfactory conditions are corrected.
   B. Beginning of installation means acceptance of existing conditions.

3.3 PREPARATION
   A. Coordinate with related trades and manufacturer’s recommendations with regard to installation in conjunction with:
      1. Reinforcing wire mesh or rebar.
      2. Preparation of space for manifold installation.
   B. Prepare the installation site as appropriate:
      1. For Concrete Slab-on-Grade: Sub-grade should be compacted, flat and smooth to prevent damage to pipe or insulation. Approved vapor barrier material should be installed. Approved thermal insulation, according to the design, shall be installed. Reinforcing wire mesh, if required by structural design, must be flat and level, with all sharp ends pointing down. Finished grade of the thermal mass must be a minimum of 3/4 inch (19 mm) above the top of PEX heating pipes.
2. For Wood Sub-floor: Sub-floor must be structurally sound, clean and free from all construction debris which could potentially damage the pipe. Replace any areas that appear weak. To facilitate installation of pipe, remove all unnecessary stud wall baseplates in doorways and other areas. Treat the wood sub-floor with a sealant in accordance with the specifications set forth by the screed installation section, or use pressure-treated wood, as per local code requirements. Finished grade of the thermal mass over pour must be a minimum of 3/4 inch (19 mm) above the top of PEX heating pipes.

3. For Precast Concrete Sub-floor: Sub-floor must be clean and free from all construction debris which could potentially damage the pipe. Finished grade of the thermal mass over pour must be a minimum of 3/4 inch (19 mm) above the top of PEX heating pipes.

C. Preparation of wall cavity for Manifold installation: See drawings to determine the width of the wall cabinet and required wall opening dimensions. Mount the manifold cabinet allowing space for the screed to fill up the front of the pipe opening. If a cabinet is not used, prepare a suitable cavity for the manifold, with a secure mounting plate that will secure the manifold at least 18 inches above floor level. Manifold must be installed in an area that will allow easy access for supply/return piping as well as future access maintenance.

3.4 INSTALLATION

A. Install in accordance with manufacturer's published installation manual and/or published guidelines and final shop drawings.

B. Mount manifolds in the locations previously prepared or in previously installed cabinets, if used. Manifolds shall be mounted as level as possible.

C. Route piping in an orderly manner, according to layout and spacing shown in final shop drawings. All installation notes shown on the drawings shall be followed.

D. At connections and fittings, use a plastic pipe cutter to ensure square and clean cuts, and join pipes immediately or cap ends of pipe to seal from contaminants. Where fittings are installed within the thermal mass, they shall be wrapped in non-adhesive waterproof silicone tape or sealed within a heat-shrink material approved by the manufacturer.

E. Pipe shall be dispensed using a suitable uncoiling device. Remove twists prior to securing pipe. Pipe shall lie flat on an even plane. Finished grade of a thermal mass shall be a minimum of 3/4 inch above the top of PEX heating pipes. Fasten piping at no more than 3 feet intervals, being careful not to twist the pipe. In thin concrete slabs, secure piping every 2 feet. Use only fasteners supplied or approved by the manufacturer of the PEX pipe.

F. Piping that passes through expansion joints shall be covered in protective polyethylene convoluted sleeving (flexible conduit) extending 15 inches (38 cm) on each side of the joint. Sleeving shall be secured on pipe to prevent movement during installation of thermal mass.

G. Where piping exits the thermal mass, a protective conduit shall be placed around the pipe, with the conduit extending a minimum of 6 inches into the floor and exiting by a minimum of 6 inches. For penetrations at manifolds, use rigid PVC bend guides secured in place to prevent movement.

H. At the time of installation of each circuit of pipe, connect the pipe to the correct manifold outlet and record pipe length for balancing. If manifold is not installed, cap the end of the pipe and label the pipe's circuit numbers along with S for supply and R for return. Connect pipes to manifold as soon as possible and record circuit lengths. All circuits shall be labeled to indicate circuit length and serviced area.

I. The following precautions shall be taken in areas intended for carpet:
   1. Notify carpet installer that radiant heating pipes have been installed.
   2. Keep pipes 6 inches from all wall baseplates.
   3. Install metal guards where pipe will pass through wall baseplates and where carpet tack strips will be installed.

J. The following precautions shall be taken in areas intended for hardwood flooring:
   1. Ensure that nailing areas for hardwood flooring, if nailing is required, are clearly marked and known for hardwood installers.
K. If the radiant heating system substrate material (thermal mass) requires curing and/or has other limitations which can be influenced by the radiant heating system while in operation, then the radiant heating system shall not be put into operation until such time that the substrate material has fully cured or set according to the material requirements of the substrate manufacturer.

L. The installer shall confirm minimum and maximum exposure temperatures for the substrate material (thermal mass) and shall ensure proper radiant heating operating temperatures.

3.5 FIELD QUALITY CONTROL

A. Filling, Testing & Balancing: Tests of hydronic heating systems shall comply with authorities having jurisdiction, and, where required, shall be witnessed by the building official.

B. Pressure gauges used in testing and balancing shall show pressure increments of 1 psig and shall be located at or near the lowest points in the distribution system.

C. Air Test
   1. Charge the completed, yet unconcealed pipes with air at a minimum of 40 psig.
   2. Do not exceed 150 psig.
   3. Use liquid gas detector or soap solution to check for leakage at manifold connections.

D. Water Test
   1. Purge air from pipes.
   2. Charge the completed, yet unconcealed pipes with water.
   3. Take necessary precautions to prevent water from freezing.
   4. Check the system for leakage, especially at all pipe joints.

E. Perform a preliminary pressure test pressurizing the system to the greater of 1.5 times the maximum operating pressure or 100 psig for 30 minutes.
   1. As the piping expands, restore pressure, first at 10 minutes into the test and again at 20 minutes.
   2. At the end of the 30-minute preliminary test, pressure shall not fall by more than 8 psig from the maximum, and there shall be no leakage.

F. After successfully performing the preliminary pressure test, perform the main pressure test immediately.
   1. The test pressure shall be restored and continued as the main test for 2 hours.
   2. The main test pressure shall not fall more than 3 psig after 2 hours.
   3. No leakage shall be detected.

G. Pressure shall be maintained and monitored during installation of the thermal mass.
   1. If any leak is detected during installation of thermal mass, leak shall be found immediately and the area cleared for repair using manufacturer’s approved repair coupling.
   2. Retest before covering repair.

H. Complete inspection and furnish test reports supplied by the manufacturer of the system.

3.6 CLEANING

A. Clean exposed surfaces upon completion of installation using clean, damp cloth. No cleaning agents are allowed.

B. Comply with manufacturer’s recommendations.

3.7 PROTECTION

A. Protect installation throughout construction process until date of final completion.

B. Replace components that cannot be repaired.

END OF SECTION
SECTION 23 3114
LOW-PRESSURE STEEL DUCTWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of contract, including General and Supplementary Conditions and Division-01 Specification sections, apply to work of this section.
B. Section 230501 Basic Mechanical Materials and Methods sections apply to work of this section.
C. Section 230593 - Smoke testing
D. Section 233123 - Underground Ductwork
E. Section 233115 - High Pressure Ductwork
F. Section 230934 - Temperature control damper actuators and actuator linkages

1.2 SUMMARY
A. Includes But Not Limited To
   1. Furnish and install above-grade ductwork and related items as described in Contract Documents.
   2. All materials and equipment specified under this section shall be American manufactured and made.

PART 2 - PRODUCTS

2.1 DUCTS
A. Use of aluminum, non-metallic, or round ducts is permitted only as directed on plans.

2.2 DUCT JOINTS
A. Ducts with sides up to and including 36 inches shall be fabricated using SMACNA T-1 and T-3 joints.

2.3 FLEXIBLE EQUIPMENT CONNECTIONS
A. 30 oz closely woven UL approved glass fabric, double coated with neoprene.
B. Fire retardant, waterproof, air-tight, resistant to acids and grease, and withstand constant temperatures of 250°F.
C. Approved Manufacturers
   1. Cain - N-100
   2. Duro Dyne - MFN
   3. Ventfabrics - Ventglas

2.4 DUCT SEALER
A. Approved Manufacturers
   1. Cain - Duct Butter or Butter Tak
   2. Design Polymeric - DP 1010
   3. DSC - Stretch Coat
   4. Duro Dyne - S2
   5. Hardcast - #601 Iron-Grip or Peel-N-Seal Tape
   6. Kingco - 15-325
   7. Mon-Eco - 44-41
   8. Trans-Continental Equipment Co - Multipurpose Duct Sealant
   9. United - Sheet Metal duct-sealer

PART 3 - EXECUTION

3.1 INSTALLATION
A. Ducts
   1. Straight and smooth on inside with joints neatly finished unless otherwise directed.
   2. Duct panels through 48 inch dimension having acoustic duct liner need not be crossbroken or beaded.
3. Crossbreak unlined ducts and duct panels larger than 48 inch or bead 12 inches on center.

4. Securely anchor ducts to building structure with specified duct hangers attached with screws or C-clamps.

5. Brace and install ducts so they shall be free of vibration under all conditions of operation.

6. Ducts shall not bear on top of structural members.

7. Make duct take-offs to branches, registers, grilles, and diffusers as detailed on Drawings.

8. Ducts shall be large enough to accommodate inside acoustic duct liner. Dimensions shown on Drawings are net clear inside dimensions after duct liner has been installed.


10. Install internal ends of slip joints in direction of flow. Make joints air tight using specified duct sealer.

11. Cover horizontal and longitudinal joints on exterior ducts with two layers of Hardcast tape installed with Hardcast HC-20 adhesive according to Manufacturer's recommendations.

12. Paint ductwork visible through registers, grilles, and diffusers flat black.

B. Install flexible inlet and outlet duct connections to each furnace, fan, fan coil unit, and air handling unit.

END OF SECTION
SECTION 23 3300
AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY
A. Includes But Not Limited To:
   1. Furnish and install duct accessories in specified ductwork as described in Contract Documents.
B. Related Sections:
   1. Section 230933: Temperature control damper actuators and actuator linkages.
   2. Section 233001: Common Duct Requirements.

1.2 REFERENCES
A. American Society for Testing and Materials:
   1. ASTM A 653-02a, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.'
   3. ASTM C 1071-00, 'Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Acoustical Material).'

PART 2 - PRODUCTS

2.1 COMPONENTS
A. Acoustical Liner System:
   1. Duct Liner:
      a. One inch 25 mm thick, 1-1/2 lb 2.2 kg per cu meter density fiberglass conforming to requirements of ASTM C 1071. Liner will not support microbial growth when tested in accordance with ASTM C 665.
      b. Category Four Approved Products. See Section 01 6000 for definitions of Categories.
         1) Ultralite or ToughGard by CertainTeed.
         2) Duct Liner E-M by Knauf Fiber Glass.
         3) Akousti-Liner by Manson Insulation.
         4) Aeroflex Plus by Owens Corning.
         5) Linacoustic by Johns-Manville.

   2. Adhesive:
      a. Category Four Approved Water-Based Products. See Section 016000 for definitions of Categories.
         1) Cain: Hydrotak.
         2) Design Polymeric: DP2501 or DP2502 (CMCL-2501).
         3) Duro Dyne: WSA.
         4) Hardcast: IA-901.
         5) Kingco: 10-568.
         7) Mon-Eco: 22-67 or 22-76.
         8) Polymer Adhesive: Glasstack #35.
         9) Techno Adhesive: 133.
      b. Category Four Approved Solvent-Based (non-flammable) Products. See Section 016000 for definitions of Categories.
         1) Cain: Safetak.
         2) Duro Dyne: FPG.
         3) Hardcast: Glas-Grip 648-NFSE.
         4) Kingco: 15-137.
5) Miracle: PF91.
7) Polymer Adhesive: Q-Tack.
8) Techno Adhesive: ‘Non-Flam’ 106.

c. Category Four Approved Solvent-Based (flammable) Products. See Section 016000 for definitions of Categories.
1) Cain: HV200.
2) Duro Dyne: MPG.
3) Hardcast: Glas-Grip 636-SE.
4) Kingco: 15-146.
5) Miracle: PF-96.
6) Mon-Eco: 22-22.
7) Polymer Adhesive: R-Tack.

3. Fasteners:
   a. Adhesively secured fasteners not allowed.
   b. Category Four Approved Products. See Section 016000 for definitions of Categories.
      1) AGM Industries Inc: ‘DynaPoint’ Series RP-9 pin.
      2) Cain.
      3) Duro Dyne.
      4) Dyn Air: DWT or FWT
      5) Omak dished head ‘Insul-Pins.’
      6) Gripnails may be used if each nail is installed by ‘Grip Nail Air Hammer’ or by ‘Automatic Fastener Equipment’ in accordance with Manufacturer’s recommendations.

B. Flexible Equipment Connections:
1. 30 oz closely woven UL approved glass fabric, double coated with neoprene.
2. Fire retardant, waterproof, air-tight, resistant to acids and grease, and withstand constant temperatures of 250 deg F 121 deg C.
3. Category Four Approved Products. See Section 016000 for definitions of Categories.
   a. Cain: N-100.
   b. Duro Dyne: MFN.
   c. Dyn Air: CPN with G-90 galvanized off-set seam
   d. Elgen: ZLN.
   e. Ventfabrics: Ventglas.
   f. Ductmate: ProFlex.

C. Dampers And Damper Accessories:
1. Locking Quadrant Damper Regulators:
   a. Category Four Approved Products. See Section 016000 for definitions of Categories.
      2) Dyn Air: QPS-385
      3) Ventfabrics: Ventline 555.
      4) Young: No. 1.

2. Volume Dampers:
   a. Factory-manufactured 16 ga 1.59 mm galvanized steel, single blade and opposed blade type with 3/8 inch 10 mm axles and end bearings. Blade width 8 inches 200 mm maximum. Blades shall have 1/8 inch 3 mm clearance all around.
      1) Damper shall operate within acoustical duct liner.
      2) Provide channel spacer equal to thickness of duct liner.
   b. Dampers above removable ceiling and in Mechanical Rooms shall have locking quadrant on bottom or side of duct. Otherwise, furnish with concealed ceiling damper regulator and cover plate.
   c. Category Four Approved Products. See Section 016000 for definitions of Categories.
      1) Air-Rite: Model CD-2.
3. Motorized Outside Air Dampers:
   a. Low leakage type. AMCA certified.
   b. Damper Blades:
      1) Steel or aluminum airfoil type with mechanically locked blade seals, 8 inch
         200 mm blade width maximum measured perpendicular to axis of damper.
      2) Jamb seals shall be flexible metal compression type.
      3) Opposed or single blade type.
   c. Make provision for damper actuators and actuator linkages to be mounted external
      of air flow.
   d. Category Four Approved Products. See Section 01 6000 for definitions of
      Categories.
      1) Air Balance: AC 526.
      2) American Warming: AC526.
      4) C & S: AC50.
      5) Cesco:AGO3.
      6) Honeywell: D-643.
      7) Pottorff: CD-52.
      8) Ruskin: CD-60.

4. Backdraft Dampers:
   a. Backdraft blades shall be nonmetallic neoprene coated fiberglass type.
   b. Stop shall be galvanized steel screen or expanded metal, 1/2 inch 13 mm mesh.
   c. Frame shall be galvanized steel or extruded aluminum alloy.
   d. Category Four Approved Products. See Section 01 6000 for definitions of
      Categories.
      1) Air-Rite: Model BDD-3.
      5) Daniel: FBD-H/V.
      6) Pottorff: 50FBD.
      7) Ruskin: NMS2.
      8) UTEMP: BFEA.

D. Air Turns:
   2. 4-1/2 inch 113 mm wide vane rail. Junior vane rail not acceptable.

2.2 MANUFACTURERS
   A. Contact Information:
11. Daniel Manufacturing, Ogden, UT (801) 622-5924.
24. Kingco - King Adhesive Corp, St Louis, MO (800) 233-8171 or (314) 772-9953.
27. Metco Inc, Salt Lake City, UT (801) 467-1572.
28. Miracle.
29. Mon-Eco Industries Inc, East Brunswick, NJ (800) 899-6326 or (908) 257-7942.
31. Omark.
37. Techno Adhesive.
38. Titus, Richardson, TX (972) 699-1030. www.titus-hvac.com
40. Utemp Inc, Salt Lake City, UT (801) 978-9265.

### 2.3 FABRICATION

**A. Duct Liner:**

1. Install mat finish surface on airstream side. Secure insulation to cleaned sheet metal duct with continuous 100 percent coat of adhesive and with 3/4 inch 19 mm long mechanical fasteners 12 inches 300 mm on center maximum unless detailed otherwise on Drawings. Pin all duct liner.

2. Accurately cut liner and thoroughly coat ends with adhesive. Butt joints tightly. Top and bottom sections of insulation shall overlap sides. If liner is all one piece, folded corners shall be tight against metal. Ends shall butt tightly together.

3. Coat longitudinal and transverse edges of liner with adhesive.

**B. Air Turns:**

1. Permanently install vanes arranged to permit air to make abrupt turn without appreciable turbulence, in 90 degree elbows of above ground supply and return ductwork.

2. Quiet and free from vibration when system is in operation.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

**A. Duct Liner:**

1. Furnish and install acoustic lining in following types of ducts:
   a. Supply air.
   b. Return air.
   c. Transfer air.
d. Relief air.
e. Exhaust air.
f. Elbows, fittings, and diffuser drops greater than 12 inches in length.

B. Flexible Connections: Install flexible inlet and outlet duct connections to each furnace.

C. Dampers And Damper Accessories:
   1. Install concealed ceiling damper regulators.
      a. Paint cover plates to match ceiling tile.
      b. Do not install damper regulators for dampers located directly above removable ceilings or in Mechanical Rooms.
   2. Provide each take-off with an adjustable volume damper to balance that branch.
      a. Anchor dampers securely to duct.
      b. Install dampers in main ducts within insulation.
      c. Dampers in branch ducts shall fit against sheet metal walls, bottom and top of duct, and be securely fastened. Cut duct liner to allow damper to fit against sheet metal.
      d. Where concealed ceiling damper regulators are installed, provide cover plate.
   3. Install motorized dampers.

END OF SECTION
SECTION 23 3400
EXHAUST FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Drawings and general provisions of contract, including General and Supplementary Conditions
      and Division 01 Specification sections, apply to work of this section.
   B. Section 230501 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 SUMMARY
   A. Includes But Not Limited To
      1. Furnish and install exhaust fans as described in Contract Documents.

1.3 QUALITY ASSURANCES
   A. Requirements of Regulatory Agencies -
      1. Bear AMCA seal and UL label.

PART 2 - PRODUCTS

2.1 INLINE FAN
   A. Duct mounted supply, exhaust or return fans shall be of the centrifugal, direct driven or
      belt driven in-line type.
   B. The fan housing shall be of the square design, constructed of heavy gauge galvanized
      steel and shall include square duct mounting collars.
   C. Fan construction shall include two removable access panels located perpendicular to the
      motor mounting panel. The access panels must be of sufficient size to permit easy
      access to all interior components.
   D. The fan wheel shall be centrifugal backward inclined, constructed of aluminum and
      shall include a wheel cone carefully matched to the inlet cone for precise running
      tolerances. Wheels shall be statically and dynamically balanced.
   E. Motors shall be permanently lubricated and carefully matched to the fan loads. Motors
      shall be readily accessible for maintenance.
   F. A NEMA I disconnect switch shall be provided as standard. Factory wiring shall be
      provided from motor to the handy box.
   G. All fans shall bear the AMCA Certified Ratings Seal for both sound and air performance.
   H. Each fan shall bear a permanently affixed manufacturer's nameplate containing the
      model number and individual serial number for future identification.
   I. Motors in the airstream shall have fan wheel mounted to motor shaft and support for
      weight. Motors and drives that are mounted out of the airstream shall provide the
      following:
      1. Drives shall be sized for a minimum of 150% of driven horsepower.
      2. Pulleys shall be of the fully machined cast iron type, keyed and securely
         attached to the wheel and motor shafts.
      3. Motor pulleys shall be adjustable for final system balancing.
   J. Approved Manufacturers
      1. PennBarry
      2. Cook
      3. Greenheck
      4. Jenn-Air
PART 3 - EXECUTION

3.1 INSTALLATION

A. Anchor fan units securely to structure or curb.

END OF SECTION
SECTION 23 3713
DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY
A. Includes But Not Limited To:
   1. Furnish and install diffusers, registers, and grilles connected to ductwork as described in Contract Documents.
B. Related Sections:
   1. Section 233001: General Duct Requirements.

1.2 MAINTENANCE
A. Extra Materials: Leave tool for removing core of each different type of grille for building custodian.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS
A. Supply Grilles And Registers:
   1. Finish: Off-white baked enamel.
   2. Removable core.
   3. Category Four Approved Products. See Section 01 6000 for definitions of Categories.
      a. Carnes
      b. J & J
      c. Krueger
      d. Metal*Aire
      e. Nailor
      f. Price
      g. Titus
      h. Tuttle & Bailey.
B. High Side Wall Return Grilles:
   1. Finish: Off-white baked enamel.
   2. Category Four Approved Products. See Section 01 6000 for definitions of Categories.
      a. Carnes
      b. J & J
      c. Metal*Aire
      d. Krueger
      e. Nailor
      f. Price
      g. Titus
      h. Tuttle & Bailey
C. Soffit Grilles:
   2. Aluminum with aluminum mesh insect screen.
   3. Category Four Approved Products. See Section 01 6000 for definitions of Categories.
      a. Carnes
      b. J & J
      c. Krueger
      d. Metal*Aire
      e. Nailor
      f. Price
      g. Titus
      h. Tuttle & Bailey
2.2 MANUFACTURERS
A. Contact Information:
   1. Carnes Co, Verona, MI www.carnes.com

PART 3 - EXECUTION

3.1 INSTALLATION
A. Anchor securely into openings. Secure frames to ductwork by using four sheet metal screws, one per side. Level floor registers and anchor securely into floor.

3.2 ADJUSTING
A. Set sidewall supply register blades at 15° upward deflection

END OF SECTION
SECTION 23 3714
LOUVERS AND VENTS

PART 1 - GENERAL

1.1 SUMMARY
A. Includes But Not Limited To:
   1. Furnish and install louvers connected to ductwork as described in Contract Documents.
B. Products Supplied But Not Installed Under This Section:
   1. Architectural louvers not connected to ductwork.
C. Related Sections:
   1. Section 062001: Installation of architectural louvers not connected to ductwork.
   2. Section 233114: Low Pressure Steel Ductwork

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS
A. Louvers:
   1. General:
      a. Extruded aluminum, with blades welded or screwed into frames.
      b. Frames shall have mitered corners.
      c. Louvers shall be recessed, flanged, stationary, or removable as noted on Drawings.
      d. Finish:
         1) Polyvinyledeene Fluoride (PVF2) Resin-base finish (Kynar 500 or Hylar 5000) containing 70 percent minimum PVF2 in resin portion of formula. Thermo-cured two coat system consisting of corrosion inhibiting epoxy primer and top coat factory applied over properly pre-treated metal.
         2) Color as selected by Architect from Manufacturer’s standard colors.

2.2 MANUFACTURERS
A. Contact Information:
   1. Air Control Products, Salt Lake City, UT (800) 245-2252 or (801) 262-9933.

PART 3 - EXECUTION

3.1 INSTALLATION
A. Anchor securely into openings.
B. Where louvers touch masonry or dissimilar metals, protect with heavy coat of asphaltum paint.

END OF SECTION
PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:
A. Extent of boiler work required by this section is indicated on drawings and schedules, and by requirements of this section.
B. Refer to other Division 23 sections for piping, specialties, water treatment, pumps, breechings, temperature controls, etc., required external to boilers for installation; not work of this section.
C. Electrical Work: Refer to Division-23 section “Electrical Provisions of Mechanical Work” for requirements.
D. Electrical Work: Provide the following wiring as work of this section, in accordance with requirements of Division 26:
   1. Furnish to Electrical Installer, burner emergency shutoff switch.
   2. Provide control wiring between boiler control panel and thermostats, aquastats, pressurestats, safeties, or any other control device related to the boilers.
   3. Provide controls and electrical devices as specified in this section.
E. Refer to Division-26 sections for other electrical work including motor starters, disconnects, wires/cables, raceways, and other required electrical devices; not work of this section.

1.2 QUALITY ASSURANCE:
A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of boilers, of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.
B. Manufacturer's Test: All boilers shall be factory assembled and tested in accordance with ASME applicable code. Submit ASME stamped test results to Architect/Engineer prior to shipping.
C. Codes and Standards:
   1. Condensing Boilers:
      a. Boiler testing and rating to be in accordance with ANSI Z21.13-2014
      b. Minimum steady state efficiency of boilers shall not be less than prescribed by ASHRAE 90.1.
      c. NFPA Compliance: Install gas-fired boilers in accordance with NFPA "National Fuel Gas Code".
      d. ASME Compliance: Construct boilers in accordance with ASME Boiler and Pressure Vessel Code, Section IV "Heating Boilers". Boiler shall be ASME labeled.
      e. UL Compliance: Provide boiler ancillary electrical components, which have been "listed" and "labeled" by UL.
      f. FM Compliance: Provide control devices and control sequences in accordance with requirements of Factory Mutual System (FM).

1.3 SUBMITTALS:
A. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, weights (shipping, installed, and operating), furnished specialties, flue sizing recommendations and accessories; and installation and start-up instructions.
B. Shop Drawings: Submit manufacturer's assembly-type shop drawings indicating dimensions, weights, loadings, required clearances, and method of field assembly, components and location and size of each field connection.
C. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to boilers. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring required for final installation of boilers and controls. Clearly differentiate between portions of wiring that are factory installed and portions to be field-installed.
D. Record Drawings: At project closeout, submit record drawings of installed systems products in accordance with requirements of Division 23.
E. Maintenance Data: Submit maintenance data and parts list for each boiler, control, and accessory; including “trouble-shooting” maintenance guide. Include this data, product data, shop drawings, and wiring diagrams in maintenance manual; in accordance with requirements of Division 23.

1.4 DELIVERY, STORAGE, AND HANDLING:
A. Handle boiler components and equipment carefully to prevent damage, breaking, and scoring. Do not install damaged components; replace with new.
B. Store boiler sections and equipment in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.
C. Comply with manufacturer's rigging and moving instructions for unloading boilers, and moving them to final location.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Modular Condensing Hot Water Boilers:
      a. Buderus
      b. Viessmann
      c. Lochinvar

2.2 CONDENSING HEATING WATER BOILERS:
A. Design: The boiler shall be gas floor standing condensing boiler with multiple stainless steel heat exchangers for redundancy. Each 500 MBH module is fully independent and “stand alone” thus allowing boiler operation even if an adjacent module is turned off. The boiler shall be ETL certified as a condensing boiler. The boiler shall operate with natural gas or propane and have an ETL certified input rating as noted on the drawings, and shall be listed with AHRI and shall have a minimum thermal efficiency rating of 96.1% at rated input. The boiler shall be designed for a minimum of 5:1 turn down per module with up to 40:1 turndown on a combined 4,000 MBH cascade system. The boiler will use a direct ignition system. The design shall provide quite burner ignition and operation. The burner shall be pre-mix radial type and fire in 360 degrees vertical pattern.
B. Construction:
   1. The boiler is a modular design with (2) independently operated 500 MBH modules per cabinet, cascadeable up to (4) cabinets or 4,000 MBH total input.
   2. The heat exchangers shall have welded construction (no gaskets) and shall be a fully condensing cylindrical counter-flow water tube design with stainless steel tubes and headers.
   3. Each 500 MBH module shall be fully independent and “stand alone” with maximum working pressure of 80 psig.
   4. The boiler shall be capable of operating with a minimum outlet water temperature of 68º F.
   5. Each heat exchanger shall be accessible for visual inspection and cleaning of all internal surfaces.
   6. Each heat exchanger shall be equipped with a water pump, flow meter, condensate trap and drain valve.
   7. The boiler shall be sealed combustion equipped with an engineered gas/air chamber that ensures proper mixing for stable combustion at all firing rates.
   8. The combustion chamber shall be a stainless steel construction and an integral part of the heat exchanger which shall be a cylindrical stainless steel counter-flow design.
   9. Each boiler shall be provided with a factory assembled, piped and wired main gas train.
   10. The main gas train shall consist a low gas pressure switch (manual reset) and a high gas pressure switch (manual reset) as required by code.
   11. Each heat exchanger shall have its own gas valve and shutoff valves; one upstream of the gas valve and one between the gas valve and blower.
   12. The burner shall be a premix burner with a stainless steel knitted metal fiber construction.
C. Controls
   1. The boiler shall have a touchscreen display located outside the front panel.
   2. The outer display shall have a 7” color touchscreen and shall provide full diagnostics including real time data logging.
   3. The control shall be capable of lead/lag sequencing up to eight 8 modules.

D. Venting
   1. The following category IV vent materials shall be utilized:
      a. AL29-4C or Stainless for all system applications
      b. PP, polypropylene for all system applications
      c. CPVC and PVC for low temperature systems

E. Boiler Plant Startup:
   1. Boiler plant shall be started up by a factory trained and authorized service agent.

PART 3 - EXECUTION

3.1 INSPECTION:
   A. Examine areas and conditions under which boilers are to be installed, and substrate which will support boilers. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF CONDENSING BOILERS:
   A. General: Install boilers in accordance with manufacturer's installation instructions, in accordance with State and local code requirements, and in accordance with requirements of local Utility Company. Install units plumb and level, to tolerance of 1/8inch in 10-0 inches in both directions. Maintain manufacturer's recommended clearances around and over boilers.
   B. Support: Install boilers on 4 inches thick concrete pad, 6 inches larger on each side than base of unit.
   C. Erection: Assemble boiler components in proper sequence and per factory instructions. Assemble boiler trim shipped loose, or unassembled for shipment purposes. Follow manufacturer's installation instructions.
   D. Electrical Work: Install electrical devices furnished by manufacturer but not factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.
      1. Verify that electrical work installation is in accordance with manufacturer's submittal and installation requirements of Division-26 sections. Do not proceed with equipment start-up until electrical work is acceptable to equipment Installer.
   E. Gas Piping: Refer to Division-23 section "Natural Gas Systems". Connect gas piping to boiler, full size of boiler gas train inlet. Provide union with sufficient clearance for burner removal, inspection and service.
   F. Heating Water Piping: Refer to Division-23 section "Hydronic Piping". Connect supply and return boiler tappings as indicated, with shutoff valve and union or flange at each connection.
   G. Breeching: Refer to Division-23 section "Breechings, Chimneys, and Stacks". Connect breeching to boiler outlet, full size of outlet. Route as indicated.

3.3 FIELD QUALITY CONTROL:
   A. Flush and clean boilers upon completion of installation, in accordance with manufacturer's start-up instructions.
   B. Hydrostatically test assembled boiler and piping in accordance with applicable sections of ASME Boiler and Pressure Vessel Code.
   C. Arrange with National Board of Boiler and Pressure Vessel Inspectors for inspection of boiler piping, observation of hydrostatic testing, and for certification of completed boiler units.
   D. Employ certified boiler manufacturer representative to start-up boilers, in accordance with manufacturer's start-up instructions. Test controls and demonstrate compliance with requirements. Adjust burner for maximum burning efficiency. Replace damaged or malfunctioning controls and equipment.

3.4 ADJUSTING AND CLEANING:
   A. Clean and flush hydronic piping systems. Remove, clean, and replace strainer screens. After cleaning and flushing hydronic piping system, but before balancing, remove disposable fine mesh strainers in pump suction diffusers.
B. Mark calibrated name plates of pump discharge valves after hydronic system balancing has been completed, to permanently indicate final balanced position.

C. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer’s touch-up paint.

3.5 DEMONSTRATION:
A. Services: After testing and inspection is complete, provide the services of an authorized factory service representative to perform start-up and operation demonstration service.

B. Start-up: Perform services in accordance with manufacturer’s written start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

C. Maintenance and Operation Training: As a part of the maintenance and operating instructions, review data in operating and maintenance manual, including preventative maintenance schedule and procedures, and procedures for obtaining repair parts and technical assistance. Demonstrate all phases of operation including start-up and shut-down.
1. Schedule training with Owner, provide at least 7-day notice to Architect/Engineer.
2. Training shall include at a minimum the following:
   a. Hydronic system theory and operation of the installed system
   b. Boiler plant component identification
   c. Boiler component identification
   d. Startup procedures
   e. Shutdown procedures
   f. Emergency operation and procedures
   g. Review of safety items
   h. Troubleshooting procedures
   i. Operation of the plant both in automatic and manual mode
   j. Demonstrate how to inspect and clean flue side of the heat exchanger (must go through complete procedure to ensure the owner is comfortable with how to handle annual inspection).
   k. Demonstrate complete maintenance requirements for all time periods (daily, weekly, monthly, semi-annual and annual)
   l. Provide complete parts list, as well as a list of any parts needed to complete the maintenance items demonstrated above.

D. Provide a certified startup and combustion test record for each Boiler which shall include a minimum of the following information submitted following the test.
1. Boiler serial number
2. Fuel type
3. Combustion Efficiency and the job conditions at the time of testing
4. Ambient and Stack temperatures
5. Oxygen %
6. CO content
7. CO2 %
8. Stack draft pressure
9. Excess air %
10. NOx levels

END OF SECTION 23 5200
SECTION 26 0501
COMMON ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division - 01 Specification sections, apply to work of this section.

B. This is Division 26 of the project specifications; this coupled with the drawings are to be used in the construction of this project. Each section recorded hereafter makes reference to the electrical systems, equipment, materials, connections, etc., and apply to all the work making reference and/or titled Electrical and/or Electrical Contract Documents.

C. Architectural, Structural, Fire Sprinkling, Plumbing, Mechanical and other applicable and related documents are considered a part of the electrical documents insofar as they apply as if referred to in full.

1.2 SCOPE OF WORK
A. The scope of this project is to construct a complete electrical system for the ITD Brine Facility Downey, Idaho. Each area shall be developed electrically to give proper illumination, power utilization, auxiliary networks, etc. When the project is complete all systems integrate into a total electrical network making the building a usable facility.

B. Extent of electrical work is indicated on drawings and/or specified in Divisions 26-28 sections of the specification. Provide all labor, materials, equipment, supervision and service necessary for a complete electrical system. Work includes, but is not necessarily limited to, the following items:
   1. 260508 - Basic Electrical Materials and Methods
   2. 260510 - Existing Facilities and Equipment
   3. 260515 - Electric Service Connection
   4. 260519 - Low Voltage Electrical Power Conductors and Cables
   5. 260520 - Electrical Wiring Connections
   7. 260526 - Grounding and Bonding
   8. 260529 - Concrete Platforms and Bases
   9. 260533 - Raceways for Electrical System
  10. 260534 - Boxes, Pull Boxes, Conduit Bodies and Fitting
  12. 260548 - Electrical Supports and Seismic Restraints
  13. 260553 - Electrical Identification
  15. 260923 - Lighting Control Devices
  18. 262416 - Panelboards
  21. 262726 - Wiring Devices
  22. 262813 - Fuses
  24. 262910 - Overcurrent Protective Devices
  31. 265100 - Interior Lighting
  33. 265200 - Emergency Lighting
  34. 265600 - Exterior Lighting

C. 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.
1.3 CONTRACT DOCUMENTS AND EXAMINATION OF THE SITE
A. Each bidder shall study the construction documents (plans and specifications), visit the site of the proposed work to fully acquaint himself with the conditions relating to the construction, so that he understands the difficulties and restrictions attending the execution of the work to be placed under contract. From all of the above information, together with the cost of equipment, materials, labor, etc., the bidder shall then assemble and submit his cost to complete the project. The failure or omission of any bidder to receive or examine any contract documents, form, instrument, addendum or other document or to visit the site and acquaint their self with existing conditions shall in no way relieve any bidder from obligations with respect to his bid or to the contract. Written addendums (formally issued) become a part and parcel to the construction documents. The submission of a bid shall be taken as prima facie evidence of compliance with this section.

1.4 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS
A. Any person contemplating submitting a bid shall familiarize himself with the drawings, specifications and project site. If for any reason, the bidder of the proposed contract, is in doubt as to the true meaning of any part of the drawings, specifications, or other contract documents, or finds discrepancies in, or omissions from, the drawings and specifications he shall submit a written request for an interpretation, correction and/or clarification to Architect/Engineer. The person submitting the request shall be responsible for its prompt delivery. Any interpretation or correction of the contract documents prior to bid shall be made only by addenda duly issued. An oral statement by anyone on any provision in the contract documents prior to the bidding is declared invalid.

B. After acceptance of the contract, the Contractor shall meet the intent, purpose and function of the contract documents and no changes shall be made to the contract documents, except it be in writing and/or a drawing, over the signature of the engineer and/or his representative. Any costs of materials, labor and equipment arising therefrom, shall be made known to the owner’s representative (Project Manager and/or the General Contractor) within 24 hours or the costs become the responsibility of the Contractor.

1.5 LAW AND REGULATION
A. The bidder’s attention is directed to the fact of all applicable laws, ordinances and rules and regulations of all authorities having jurisdiction over construction of the project shall apply to contract throughout, and they shall be deemed to be included in the contract of the same as though here written out in full.

1.6 CONSTRUCTION OBSERVATIONS:
A. During the course of construction of this project, the engineer shall visit the project site periodically on an as-needed basis. The construction observation intervals may vary depending on the progress and/or stage of construction and to observe the electrical conduit rough-in above or below grade, setting of the main and branch panels, auxiliary units and panels, surface mounted items, setting of equipment, equipment connections, etc. However, written field questions are encouraged and welcomed throughout the course of construction and shall be answered promptly in writing, to keep the project construction on schedule. The project foreman should have the building plans, construction schedules, etc., affixed in mind, so the electrical systems being assembled, the setting of equipment, of parts and pieces, related to the project are anticipated, to prevent delays or emergencies.

B. The engineer shall make one (1) final inspection. The contractor shall notify the engineer that the installation is complete, i.e., the systems are operating and have been tested and balanced, and everything is complete and operational, all equipment connections have been made and the owner’s representatives have been trained. At this time the engineer, the contractor, and the owner’s representative shall schedule a time to walk the project for evaluation, and record in writing the items found to be incomplete. The contractor shall make the corrections within one (1) week after this inspection. If at the conclusion of the observation tour the owner and engineer determine that additional visits are required to complete the project, the contractor shall reimburse the engineer at the rate of $600 for each site visit required, plus out of pocket expenses, until all items are acceptable to the engineer and owner. The contractor shall pay the engineer in advance of each inspection.

C. Before scheduling an additional visit, the contractor shall report to the engineer that all systems are complete, and the project is ready for the owner’s acceptance.
1.7 OFFICIAL, AGENT AND EMPLOYEES OF THE OWNER NOT PERSONALLY LIABLE
   A. It is agreed, by and between the parties hereto that in no event shall any official, officer, employee, or agent of the Owner in any way be personally liable or responsible for any covenant or agreement herein contained whether expressed or implied, nor for any statement, representation or warranty made herein or in any connection with this agreement.

1.8 SUBLetting AND SUBCONTRACTING
   A. This Bidder is responsible for the construction stated or defined in this Contract and, as such, shall abide by the Subletting and Subcontracting Fair Practices Act as set forth and outlined in the General Conditions, Designation of Subcontractors.

1.9 CONTRACTOR COORDINATION
   A. In the course of installing the systems defined in the contract documents, the contractor shall closely follow the plans, details and specifications (contract documents). The system design has been a careful and laborious undertaking, with the intent purpose of producing a system and/or systems that will serve the owner well with minimum maintenance. The contractor shall adhere as close as possible to the plans, details and specifications for each system. Questions and suggestions are encouraged as the project is being assembled. If for any reason, the contractor desires to deviate from the defined information, because he discovers a way to improve the system, make the system more easily assembled, make it operate more efficiently, etc., the contractor shall present the changes to the engineer. Systems are designed to perform a specific function; the smallest change in assembly may change the function. If the engineer agrees with the change he will authorize the contractor to proceed. Contractor cooperation and coordination is appreciated. If the contractor proceeds with construction without the designer’s authorization, it shall be reworked, in accordance to plans and specifications, at the contractor's expense.

1.10 QUALITY ASSURANCE
   A. Comply with the 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.
   B. 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.
   C. Employ only qualified craftsmen with at least three years of experience (in power equipment, conduit work, high voltage equipment, etc.). Workmanship shall be neat, have a good mechanical appearance and conform to best electrical construction practices (Media Standards of Installation). Provide a competent superintendent to direct the work at all times. Any person found incompetent by the General Contractor, Engineer, Architect, or Owner, shall be discharged from the project and replaced by satisfactory personnel.
   D. Contractor shall have a current state contracting license applicable to type of work to be performed under this contract.

1.11 MATERIALS AND WORKMANSHIP
   A. All materials and equipment furnished and installed shall be first quality, new and meet the standards of NEMA, IPCEA, LS, UL, NFPA, UBC, OSHA, NEC, and shall bear their label wherever standards have been established and label service is available. Where materials and equipment are specified by manufacturer's name, the type and quality required is thereby denoted. The Architect shall be afforded every facility deemed necessary to inspect and examine the materials and apparatus being installed to prove the material quality and skill/competency of workmanship.

1.12 DEMOLITION, PATCH AND REPAIR
   A. The Contractor is responsible for all block-outs, demolition, patching and repair of all finished interior surfaces pertaining to the installation of this particular phase of work. All repaired surfaces shall be finished (painted, etc) to match the adjacent materials, finished and color.
   B. When conduit passes through a ceiling and/or floor, block-out as required and/or core-drill - do not break out with a hammer of any type. The hole shall not be larger than half inch (½") more than the diameter of the conduit.

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C. When conduit is indicated to be installed below an existing concrete slab, cut the slab with a diamond saw and/or cutting tool. Do not just rip up the surface unless the entire section is removed.

D. When conduit is to be installed below asphalt, concrete, lawn, etc. the surface shall be cut, not ripped up, with a backhoe or other equipment (i.e., mechanically cut then remove material).

E. Seal around all electrical equipment penetrating outside walls, roofs, unheated spaces, air plenums, cold boxes, etc., with Dow Corning Silicone RTV foam.

F. All salvageable electrical equipment and materials that cannot be integrated into the new electrical network become the property of the Contractor and shall be removed from the premise.

G. Hard Surfaces: whenever demolition or excavation is required for the installation of the electrical system, it is the responsibility of the Contractor to make repairs and/or replacement of hard finish surfaces such as concrete, asphalt, etc.

H. The method of patching and repair shall follow good construction practices. All finished surfaces shall match materials, and finish (surface texture and finish - paint, etc.) wherein the demolition occurred.

I. Lawn replacement resulting from excavation is to be included in the bid.

1.13 EXCAVATION, BACKFILL AND BORING

A. The Electrical Contractor is responsible for all excavation and backfill related to the installation for Division 26. All work shall comply with the conditions stated herein and those noted in the Architectural Section under Earthwork.

B. When conduit is indicated to be installed below an existing concrete slab, cut the slab with a diamond saw and/or cutting tool. Do not just rip up the surface unless the entire section is removed.

C. Backfill: The Contractor shall backfill the excavated areas with the material removed provided it does not contain rocks larger than 0.15-inch in diameter. If the excavated material is larger than indicated, the excavated area shall be filled with sand.

D. Backfill materials shall be put in place in 4-inch lifts and compacted to 98% of the maximum dry density of ASTM 698 over the entire area of the fill.

E. After the backfill is complete the finished surface shall match the adjacent surfaces, depth, quality finish, etc. (concrete, etc.).

F. Boring, or Auging - The contractor shall employ a firm skilled in installing underground utilities - piping, conduit, etc. for at least five (5) years, with care and concern the contractor shall drive the boring tool under the bleachers with care and concern. Any damage to the existing facility shall be repaired at the expense of the Boring Contractor. The installation shall follow and comply with the intent and details shown or the plans.

1.14 PROGRESS AND COORDINATION OF WORK

A. The electrical work shall be laid out in advance of construction to eliminate unnecessary cutting, drilling, channeling, etc. Perform necessary cutting, drilling or channeling with care. Use skilled mechanics of the trades involved and repair damage to building or equipment at no additional cost to the Owner. Cutting, drilling or channeling through work performed by other trades shall only be done with the consent of the General Contractor. Cutting, drilling or channeling through structural members shall only be done with the approval of the Architect.

B. Cooperate with other trades to coordinate locations of electrical outlets and apparatus.

C. Perform for other trades, the electrical wiring and connections for all devices or apparatus where not specified herein or indicated on the drawings. Consult the Architectural and Mechanical drawings to avoid hiding switches, outlets and other equipment behind doors, cabinets, counters, heating equipment, etc. Buried electrical devices and/or connections shall be relocated as directed by Engineer and/or authority having jurisdiction, at no additional cost to the Owner.

D. Where conduit, outlets or apparatus are to be cast in concrete or encased, it must be located and secured by a journeyman or foreman present at the point of installation. He shall check the locations of the electrical items before and after the concrete and masonry installation and shall relocate displaced items.

E. No changes shall be made in the design or location of apparatus unless specifically approved in writing.
1.15 SUBMITTALS OF EQUIPMENT FOR APPROVAL

A. SHOP DRAWINGS AND PRODUCT DATA BEING INSTALLED IN THE PROJECT: 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 this specification. A brief submittal description of equipment that is approved for installation (bid documents or addendums), is given below. Refer to identified sections for detailed submittal requirements.

1. Conductors and Cables (Section 260519)
2. Metallic and Non-Metallic Conduit (Section 260533)
3. Branch Panelboards (Section 262416)
4. Receptacles, Switches, Low Voltage Switching, Coverplates, Cord Caps, Cord Connectors, Phone Jacks and Plates, Phone/Data Jacks and Plates, and Power Poles (Section 262726)
5. Overcurrent Protective Devices (Section 262910)
6. Interior Building Light Fixtures, Ballasts, etc. (Section 265100)
7. Exterior Building Lighting (Section 265600)

This list is not all inclusive. The contractor shall submit product information for all items being installed on the project, contained in the drawings or elsewhere in this specification.

B. The electrical foreman, to acquaint himself with the project, is asked to review the shop drawings prior to submission to confirm size, voltages, loads, etc. This cooperative effort will prevent problems from occurring during the course of construction. Any problems that may arise shall be phoned to the engineer and noted in writing and submitted with the shop drawings.

C. Submit complete, bound submittal in a loose-leaf binder large enough for all items (8 copies) to Architect. 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.

D. A minimum period of two weeks, exclusive of transmittal time, will be required each time a Shop Drawing and/or Brochure is submitted or resubmitted for review. This period shall be considered by the Contractor when scheduling submittal data.

E. 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 Documents shall govern and are not waived, or superceded in any way by the review of the Shop Drawings and Brochures.

F. Certifications shall be written or in the form of rubber stamp impressions as follows:

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

Observe the following rules when submitting Shop Drawings and Brochures.

1. 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 re-submittal.
2. 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/Draftsman skilled in this type of work. Shop Drawings shall be drawn to at least 1/4"-1-0" scale.

3. 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.

1.16 OPERATION AND MAINTENANCE MANUALS
A. Provide operating instructions and maintenance data books for all equipment and materials furnished under this Division.
B. Submit four copies of operating and maintenance data books for review at least four weeks before final review of the project. Assemble all data in a completely indexed volume or volumes and identify the size, model, and features indicated for each item.
C. The binder (sized to the material) shall be a 2" slide lock unit (Wilson-Jones B3-367-44). The cover shall be engraved with the job title in 1/2" high letters and the name and address of the Contractor in 1/4" high letters. Provide the same information in 1/8" letters on the spine.
D. Include complete cleaning and servicing data compiled in clearly and easily understandable form. Show serial numbers of each piece of equipment, complete list of replacement parts, motor ratings, etc. Each unit shall have its own individual sheet. (Example: If two items of equipment A and D appear on the same sheet, an individual sheet shall be provided for each unit specified.)
E. Include the following information where applicable:
   1. Identifying name and mark number.
   2. Certified outline Drawings and Shop Drawings.
   3. Parts list.
   4. Performance curves and data.
   5. Wiring diagrams.
   6. Manufacturer's recommended operating and maintenance instructions.
   7. Vendor's name and address for each item.

1.17 RECORD DRAWINGS
A. Maintain at the job site, on a daily basis, a complete set of "Record Drawings", reflecting an accurate dimensional record of all buried or concealed work. Mark "Record Drawings" to show the precise location of concealed work and equipment, including concealed or embedded conduit and junction boxes and all changes and deviations in the work from that shown on the Contract Documents. This requirement shall not be construed as authorization for the Contractor to make changes in the layout or work without definite authorization for such changes. The "Record Drawings" for daily recording shall consist of a set of blue line prints of the Contract Drawings.
B. Record dimensions clearly and accurately, delineating the work as installed; identify locations by at least two dimensions to permanent reference points.
C. Certify the "Record Drawings" for correctness by placing and signing the following certifications on the first sheet:

"CERTIFIED CORRECT (3/8" high letters)"

By ____________________________ Date ____________________________
(Name of General Contractor)

By ____________________________ Date ____________________________
(Name of Electrical Contractor)
D. GUARANTEE: 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 defects, except from ordinary wear and tear, within one year from the date of substantial completion. Exception: Incandescent and fluorescent lamps shall be guaranteed for a period of two months from the date of substantial completion.

1.18 CLEAN-UP
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 luminaires, interiors and exteriors of all equipment, and raceways. Replace all filters in electrical equipment upon request for Substantial Completion.

1.19 POWER OUTAGE
A. All power outages required for execution of this work shall occur during non-standard working hours and/or at the convenience of the Owner. Include all costs or overtime work in the base 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.

1.20 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 under way, and apparatus against loss or damage.

1.21 CONCRETE PADS AND ASPHALT
A. The Electrical Contractor shall provide the concrete (5-bag mix) and/or asphalt except as noted in the contract documents. This may also include that which is needed to replace any and all removed through demolition. It shall match the existing as to type, quality and thickness.

1.22 ELECTRICAL-MECHANICAL COORDINATION
A. General - All disconnect means, motor controllers, electrical controls, signal devices, etc., for mechanical equipment as noted in Division 23 & 24 of the specifications shall be furnished, installed, wired, and connected under Division 26. All pressure switches, thermostats, solenoid valves, damper motors, smoke duct detectors, etc. shall be supplied and installed under the Mechanical Division for electrical connection under this Division. Connection diagrams will be supplied as hereafter explained.
B. If the substitution of equipment in Division 23 results in a change to the contract documents and/or changes to the installation requirements (not covered by the contract change orders), then the Division 23 contractor shall reimburse the Division 26 contractor for additional work required.
C. If the substitution of equipment in Division 26 results in a change to the contract documents and/or changes to the installation requirements (not covered by the contract change orders), the complete responsibility for costs shall be assigned to the section of these specifications under which the equipment is furnished.
D. Provide all control conduit (See Section 260533-2.1-G(2)) with pull cord for mechanical system. No conduit is required through accessible spaces between VAV box and control transformers.

1.23 EQUIPMENT CONNECTION DIAGRAM
A. Submittal data for each individual electrically operated or electrically controlled item of equipment or device furnished under Division 23 & 24 and/or 26 of the contract documents shall include complete electrical wiring diagrams and elementary control diagrams (ladder form) showing all internal and external wiring connections and services. The submittal data shall itemize all electrical characteristics that are of a special nature or critical to the electrical installation or control system. Such equipment and devices will not be considered for approval until these requirements are met.
PART 2 - PRODUCTS

2.1 GENERAL
   A. PRODUCTS are specified by Manufacturer name, description, and/or catalog number and shall be supplied as such.
   B. DISCREPANCIES between equipment specified and the intended function of equipment shall be brought to the attention of the 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 Engineer, who will issue interpretation and/or additional instructions to Bidders before the project is bid.
   C. MANUFACTURERS AND SUBSTITUTE ITEMS: Provide products of manufacturers specified. Manufacturer's catalog numbers and descriptions establish the quality of product required.
   D. Provide only equipment specified in the contract documents or approved by addendum.

2.2 LISTED EQUIPMENT
   A. Provide and install materials, devices, appliances, equipment, etc. that conforms to applicable standards or is indicated to be acceptable by the established standards of the Underwriter's laboratories, Inc., or other electrical product testing laboratories which are accredited by the department.
   B. The statement in Item "A" above is being interpreted by the State Electrical Inspector as follows: It is understood that many specialty items such as power panels, light fixtures, devices and other building components are not available with a UL label covering the entire piece of equipment. The State will impose no requirement that an item of equipment be UL labeled unless it is available as a UL labeled item from at least two manufacturers. Electrical components of unlabeled equipment, such as motors, shall be labeled if they are available from at least two manufacturers.
   C. If any building component is available with a UL label from at least two manufacturers, an identical or similar unlabeled component shall not be acceptable for installation. Should any such component be installed, it shall be replaced with a UL labeled component, before the building will be accepted by the Electrical Engineer.
   D. Consequently, it shall be the sole responsibility of the Contractor (through project suppliers and equipment manufacturers) to purchase and install only equipment bearing the UL label whenever the equipment so labeled is available. The Contractor (should any equipment be installed without the proper UL label) shall bear the entire cost of correction to the satisfaction of the authority having jurisdiction.

2.3 SUBSTITUTIONS AND SUBSTITUTE EQUIPMENT
   A. Substitute equipment is encouraged if it is truly an equal to the specified items.
      1. The designer has taken time and effort to analyze, evaluate and prove to himself that the specified unit will perform the function needed, wherein it is placed. This means the responsibility for the function of the specified equipment rests with the designer, who knows and understands what is to be accomplished.
      2. If a supplier and/or the contractor desire to substitute equipment in place of specified item, he may do so, but he takes upon himself or herself the full responsibility that the substituted equipment will equal all of the performing characteristics, functions, etc., and/or exceed the performance of the specified item. The substitute equipment shall be of such a physical size and weight that it will mount in the designated location without alterations to the building and the structure will carry the load. If for any reason the substituted equipment requires alterations or modification, in any form to the building and/or the structure, the costs shall be paid by the contractor and/or those requesting the substitutions.
3. Those interested in requesting a substitution shall state the Manufacturer’s 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 Engineer eight (8) working days prior to day of 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.

4. Because of the short bidding period, (from issuance of drawing to bid date), between the substitution request and the bid date, the designer does not have adequate time to make a full evaluation of substitute equipment. Therefore, **those requesting the substitution must accept full responsibility** for the items being submitted for substitution (operating characteristics, physical size, weight, output, not increase the load, etc.). If at any time during the course of construction, **even up into the final completion**, if the designer finds the equipment does not meet the design criteria, comply with the performance, etc., **those requesting the substitution and the contractor have the responsibility to remove the substituted equipment and install the specified item at their expense.** There shall be no cost assessed to the owner and/or the designer and the replacement will not delay the completion of the project.

B. **Discrepancies** between equipment specified and the intended function of equipment shall be brought to the attention of the 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 specification, or should he find discrepancies therein, he shall bring this to the attention of the Engineer, who will issue interpretation and/or additional instruction to Bidders before the project is bid.

C. 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.

D. **Samples** may be required for non-standard or substituted items before installation during construction. Provide all samples as required.

E. **No materials or apparatus** may be substituted after the bid opening, except where the equipment specified has been discontinued. This substitution may be made by a change order.

F. Approved equipment shall be so noted, in writing in a formally issued **Project Addendum**.

2.4 **INCENTIVE BIDS AND UNIT PRICES**

A. Suppliers of materials, equipment, and systems are encouraged to submit incentive bids by grouping several products under one bid. However, at the request of the Architect and/or Engineer, the supplier shall submit a unit price to add or delete a particular unit, (panel, luminaire, fire alarm panel, etc.) from his quotation so that other components might be considered in the bid.

2.5 **SPARE PARTS**

A. Provide spare parts (fuses, overload heaters, diffusers, lamps, etc.) as specified. Transmit a list indicating all spare parts to Owner’s Representative prior to substantial completion. Submit copy of transmittal letter to Engineer.

B. Fuses: Provide one spare set of fuses for each size and one spare set of each additional group of five (this includes fuses for bolted pressure and HV units).

C. Thermal Overloads: Provide one spare set of thermal overload heaters of each type used in the magnetic starters.
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. Relocate buried electrical devices and/or connections as directed at no additional cost.

D. All electrical networks, power, auxiliary, etc., systems shall be installed in conduit; see Section 260533.

E. Where conduit, outlets or apparatus are to be embedded in concrete, they shall be located and secured at the defined point. 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, excavation, etc., required for installation of work specified in this Division. Opening shall be core drilled and/or saw cut and shall be no longer than required. Seal around conduit and on equipment inside and out with a silicone compound.

G. Roof Flashing: Where raceways penetrate roofing or similar area, provide 26 ga. galvanized iron roof jack, sized to fit tightly to raceway for weather tight seal, and with flange extending to a minimum of 9 inches under roofing on all sides. Coordinate all work with roofing contractor.

H. Patching and Repair

1. The Contractor is responsible for all block-outs, demolition, patching and repair of all finished interior and exterior surfaces pertaining to the installation of this particular phase of work. All surfaces shall be finished (textured, painted, etc.) to match the adjacent materials.

2. Hard Surfaces: Whenever demolition or excavation is required for the installation of the electrical system, it should be the responsibility of the Contractor to make repairs and/or replacements of hard finish surfaces such as concrete, asphalt, etc.

3. Lawn replacement is also included as a part of this section.

4. The method of patching and repair should follow good construction practices. All surfaces shall match materials and finish wherein the demolition occurred when construction is complete.

I. All electrical powered equipment specified on this project, whether specified in the architectural, mechanical, or electrical specification, shall be electrically connected and made operational. Confirm voltage, amperage, and phases.

3.2 COMPLETION OF WORK AND TESTING

A. Before energizing any circuits, make megger ground tests on conductors, bus duct and fused disconnects with the distribution breakers open. These readings shall be recorded by circuit number identification and submitted in triplicate to the Owner's Representative before the system is energized.

B. Before final inspection, but after the electrical installation is complete, the Electrical Contractor shall remove neutral grounding connection from main distribution panel and demonstrate to authority having jurisdiction and Owner's Representative, with an ohmmeter, that the electrical system neutral is grounded through main panel location only. Neutral shall be reconnected after the test is complete.
C. Emergency Power System: In the presence of the Owner's Representative, test the emergency power system, in its entirety, by transferring from normal to emergency power no less than six times to prove proper operation of all equipment, devices, light fixtures, etc. that are powered by this system. If a power pack is used, the factory representative should be present during the test. Write a letter to the Owner's Representative confirming the conditions of this test.

D. High potential tests per I.P.C.E.A., shall be made on all high voltage conductors after installation. A written report of same shall be made in duplicate to the Architect.

E. Test Equipotential grounding system throughout the building and report the results.

3.3 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.

3.4 PROJECT FINALIZATION AND START-UP

A. Upon completion of equipment and system installation, notify equipment Factory Representative and Subcontractors for system start-up.

B. Each Factory Representative and Subcontractor shall assist in start-up to examine their respective system and remain at the site until the total system operation is accepted by the Owner's Representative.

C. The Factory Representative and/or System Subcontractor shall give personal instruction on operation and maintenance of their equipment to the Owner's maintenance and/or operation personnel. To certify acceptance of operation and instruction by the Owner's Representative, the contractor shall prepare a written statement as follows:

1. This is to certify that the Factory Representative and/or System Subcontractor for each of the systems installed below have performed start-up and final check out of their respective systems is satisfactory.

D. System Operating Report: After the facility has been in operation for 10 days, submit with a letter of guarantee a triplicate record of a voltage reading and ammeter reading on each phase of the feeder for the main and all branch panels, motors, outside lighting, etc. to the facility (these readings shall be taken with all equipment operating). A second report shall be made on equipment that has a load over 20 Amp 1-pole in the mechanical room, kitchen, shops, etc. when in operation.

1. This dated system operating report shall be submitted to the Owner's representative for distribution to the engineer and a copy placed in each maintenance manual.
   a. Electrical Load Readings:
      Demand_________kw  Panel D_________Amp
      Panel A_________Amp  Panel E_________Amp
      Panel B_________Amp  Panel F_________Amp
      Panel C_________Amp
      etc. identify and record the load on each panel and motor loads 3/4 hp and larger.

2. If there are any abnormal conditions, they shall be brought to the attention of the Engineer in writing as a part of this submittal.

3. Submit with the load readings for the motors, a list of motors with the size of overload heaters used for each motor. This includes thermal switches.

4. As a part of this document, submit a copy of each Auxiliary Systems test reports (Telephone, Fire Alarm, Sound, Data, etc.) with the proper signatures (See 3.2F).

      System     Factory Representative
      (List Systems Included)     (List name and address of Factory Representative)

5. The Owner's Representative has received complete and thorough instruction in the operation and maintenance of each system (See 3.4C).

Owner's Representative Contractor     or     Electrical Foreman

6. Report that each emergency luminaire has proven operational by killing the circuit and visually confirming the luinaire illuminates (See 3.2G).
7. The Owner’s Representative has received and accepted all spare parts as heretofore required by contact (See 2.5).
8. Submit meggar OHM, equippotential, and high potential test reports (See 3.2A, 3.2D, 3.2E).
9. Send copy of acceptance to Architect/Engineer.

END OF SECTION
SECTION 26 0508
BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 MATERIALS AND METHODS
A. Materials and methods common to this project are listed below and shall be followed as closely as practicable using acceptable construction practices and specified products. This section indicates conditions and practices that should become a part of this project.
   1. Materials: The materials installed on this project shall be new, noted in this specification and shall be installed in the course of construction, except, they be changed in writing over the signature of the designer.
   2. Method: The method of installation shall follow current acceptable electrical practices under the direction of a licensed journeyman electrician. This will be further explained in the body of the specification.
   3. Notes: The notes on the plans are a part of the contract documents; a conflict between the specification and the drawings, the specifications rule.

1.2 EQUIPMENT CONNECTIONS
A. The Contractor shall install an electric service to the subject project as shown on the plans and described herein.
B. Extent of electrical connection for equipment includes final electrical connection of all equipment (supplied under this or any other division or by the owner) having electrical requirements. Make final connections for all owner furnished equipment. See other applicable Divisions of specification for building requirements, namely, mechanical, plumbing, temperature control wiring requirements, kitchen equipment, etc.
C. Refer to Division-23 sections for motor starters and controls furnished integrally with equipment.
D. Refer to Division-23 section for control system wiring; not work of this section, except as noted on the electrical plans.
E. Refer to sections of other Divisions for specific individual equipment power requirements.

1.3 QUALITY ASSURANCE
A. CODE COMPLIANCE: Comply with applicable portions of NEC, state, and local codes 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. See Section 260533, Conduit Raceways; Section 262726, Wiring Devices; and Section 260519 Conductors and Cables for additional requirements. Provide final connections for equipment consistent with the following:
   1. Permanently installed fixed equipment - flexible seal-tight conduit from branch circuit terminal equipment, or raceway; to equipment, control cabinet, terminal junction box or wiring terminals. Totally enclose all wiring in raceway.
   2. Movable and/or portable equipment - wiring device, cord cap, and multi-conductor cord suitable for the equipment and in accordance with NEC requirements (Article 400).
   3. Other methods as required by National Electrical Code and/or as required by special equipment of field conditions.

END OF SECTION
SECTION 26 0510
EXISTING FACILITIES AND EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK
A. Existing facility, whether standing alone or an addition to a standalone, or if the existing building is a part of a new facility, the bidder shall consider the existing unit a part of this project. All electrical equipment, panels, apparatus, luminaires, conduit/conductors, boxes, devices, etc., are to be removed, reworked, added to, extended, etc., as noted on the contract documents to make a complete and operable facility. The contractor shall also include in his bid an allowance to cover items that may be concealed in wall, ceiling, or floor, that must be rerouted, relocated, etc., to maintain or extend existing systems to keep them operable.
B. When the project is completed all systems, apparatus, etc., shall be made operable and left in normal operating order.

1.2 EXISTING EQUIPMENT
A. General: The electrical conditions in the existing facility are part of this project, and all costs, changes, extensions, additions, etc., pertaining thereto shall be included in the base bid.
B. Disconnect all equipment that obstructs and/or is to be relocated. Reconnect when reset.
C. The new electrical equipment and apparatus shall be coordinated and connected into the existing system as required. Auxiliary systems shall comply unless otherwise specified.
D. When conduit is to be installed below concrete, etc., the surface shall be cut, not ripped up, with a back-hoe or other equipment, but shall be mechanically cut then removed.
E. All electrical equipment and apparatus in the building not remodeled shall be connected as per specifications and left in working conditions.

END OF SECTION
SECTION 26 0515
ELECTRIC SERVICE CONNECTION

PART 1 - GENERAL

1.1 ELECTRICAL SERVICE SYSTEM
A. Provide, install and coordinate an electric service to the facility as shown on the drawings and specified herein.
B. The Contractor shall contact Idaho Power relative to the installation of this electric service. The owner will pay directly to Power Company any assessed costs to provide electric service. The electrician shall install service conduit from utility service point to transformer and from transformer to meter. Provide and install transformer pad, meter section vault, install meter section, (EUSERC, if required), etc. as per Power Company specifications. Confirm the location of the point of service prior to rough-in.
C. The service conduit shall be installed as stated in the contract document, confirm size with the serving utility.
D. Provide and install the service metering equipment, shown on the plans and/or required by the serving utility, and/or as specified in the contract documents.
E. Construction Lighting and Power is a part of the General Conditions.
F. Permanent power shall be connected as soon as the main service and panel are installed.
G. Service feeders installed in PVC and/or RMC (see Section 260533) shall be shrouded with Red 5-bags concrete 3” minimum cover with #3 rebar at all corners.
H. Phase Rotation: When the permanent service has been established, the contractor shall check the rotation of all motors and confirm proper rotation. Each motor shall have a correct rotation. Any costs arising from a reversed motor shall be the Electrical Contractors.

1.2 SERVICE CONNECTIONS
A. Provide and install the lugs, cable, labor, etc. necessary for the connection of the service power and/or transformers for the project.

1.3 MAKING ELECTRICAL CONNECTIONS
A. Make electrical connections to all equipment provided under Divisions 21, 22, 23, 26, 27 and/or 28, as it was shown on either the mechanical or electrical plans. The connection shall be in accordance with the electrical characteristics noted on the electrical drawings in writing to Architect before proceeding with rough-in work.
B. Coordinate installation of electrical connections for equipment with equipment installation work.
C. 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 in writing to Architect before proceeding with rough-in work.
D. Obtain and review the equipment shop drawings to determine particular final connection requirements before rough-in begins for each equipment item.
E. Confirm the rotation of all electric motors when making the final connection. Motors running in the reverse direction are the responsibility of this contractor.
F. Refer to basic materials and methods Section 260519, Conductors, for identification of electrical power supply conductor terminations.

END OF SECTION
SECTION 26 0519
CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 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

1.2 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.
D. Non-approved materials.
   1. AFC Cabling
   2. Non-metallic sheathed cable.
   3. Service entrance cable.

1.3 SUBMITTALS
A. FIELD TEST DATA: Submit test data in accordance with IEEE Standard 400-1980 showing ambient conditions, voltage levels, level durations, and conduction current for each step. Include effective insulation resistance in submittal.

PART 2 - PRODUCTS

2.1 COPPER CONDUCTORS (600V)
A. All conductors shall be copper with 90% conductivity.
B. Provide factory-fabricated conductors of sizes, ratings, materials, and types indicated for each service. Where not indicated provide.
C. Proper selection to comply with project's installation requirements and NEC standards. Provide conductors in accordance with the following:
   1. Distribution and Panelboard Feeders; and other conductors, #2 AWG and larger shall be Copper; see drawings for size.
   2. Conductors: All conductors shall be jacketed with THHN or XHHW insulation. Size all conductors in accordance with NEC; minimum size to be #12 AWG. Provide stranded conductors for #10 AWG and larger. Provide THHN insulated conductors (in dry areas) from outlets to luminaire, and in luminaire channels.
   3. Conductor ampacity shall comply when local codes have a derating factor because of ambient temperature.
   4. Provide color and coding of conductors as follows:
      a. Conductors
         1) All conductors shall be stranded copper wire, #12 AWG & #14 AWG may be solid copper. Color code all 208 volt wiring using black for phase A, red for phase B, blue for phase C, white for neutral and green for equipment ground.
      b. Motor Control
         1) Motor Feeders Black
         2) Hot or Stop Lead Red
         3) Start Lead Blue
         4) Common White
5) Indicating Light Orange
6) Interlock or Shunt Brown

2.2 CONNECTING BLOCKS (Also see Section 260520)
A. Taps made to conductors in wireways, switchgear, J-Boxes, etc. larger than #10 shall be made with an insulated connector. The connector block shall be an alloy that is completely compatible with copper, aluminum alloy 6061-T6 conductive plating for low contact resistance, excellent anti-pull out ability and set-screw for suring in place. The block shall be insulated with a molded high dielectric plastisol that will not support combustion, abrasive and chemical resistant. All connections shall comply with rated for 600 volt 90° C and comply with NEC 100. Torque each lug to the recommendations of the manufacturer.
B. The unit shall be NSI Series NSZ (in and out same side), other types are: Series IPL (double row), Series IT (in and out), Series IPLD (pass through), etc. The contractor shall decide which type of connection is best suited for installation.

PART 3 - EXECUTION

3.1 INSTALLATION
A. Provide #10 AWG conductors for all LED luminaire home runs.
B. Conductor size noted in panels is for the home-run. The conductor may be changed to code size after the first apparatus.
C. “G” in the Conduit symbol, denotes a #10 (or larger) green ground, which shall be installed in the conduit with other conductors. It shall connect to the ground bar in the panel.
D. GENERAL: Install electrical 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.
E. Coordinate installation work with electrical raceway and equipment installation work, as necessary for proper interface.
F. Use pulling compound or lubricant, where necessary; compounds must not deteriorate conductor or insulation.
G. Keep conductor splices to minimum in a J-box.
H. Install splices and taps which have mechanical strength and insulation rating equivalent-or-better than conductor.
I. Use splice and tap connectors which are compatible with conductor material.
J. The conductor ends shall be stripped at the ends to comply with the following chart:

<table>
<thead>
<tr>
<th>CONNECTOR SIZE</th>
<th>LENGTH (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>2</td>
</tr>
<tr>
<td>350</td>
<td>1.75</td>
</tr>
<tr>
<td>250</td>
<td>1.625</td>
</tr>
<tr>
<td>3/0</td>
<td>1.437</td>
</tr>
<tr>
<td>1/0</td>
<td>1.25</td>
</tr>
<tr>
<td>#4</td>
<td>0.875</td>
</tr>
</tbody>
</table>

2. All conductor connections on lugs, breakers, connection blocks, etc. of the set-screw type shall be set with a torque wrench in strict accordance with industry standards as recommended for each conductor size.

3. Lug Torque Chart
### Conductors and Cables

<table>
<thead>
<tr>
<th>AWG/MCM Wire Size</th>
<th>Tightening Torque, Inch Pounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>375</td>
</tr>
<tr>
<td>400</td>
<td>325</td>
</tr>
<tr>
<td>350</td>
<td>325</td>
</tr>
<tr>
<td>250</td>
<td>325, 325</td>
</tr>
<tr>
<td>4/0</td>
<td>325</td>
</tr>
<tr>
<td>3/0</td>
<td>250, 250, 250</td>
</tr>
<tr>
<td>2/0</td>
<td>180, 180, 180</td>
</tr>
<tr>
<td>1/0</td>
<td>180, 180, 180</td>
</tr>
<tr>
<td>3-2-1</td>
<td>150, 150, 150</td>
</tr>
<tr>
<td>#4 - #6</td>
<td>110, 110, 110, 110, 110</td>
</tr>
<tr>
<td>#8</td>
<td>75, 75, 75, 75, 75, 75</td>
</tr>
<tr>
<td>#10 - #16</td>
<td>75, 75, 75, 75, 75, 75</td>
</tr>
</tbody>
</table>

K. **Vertical Support**: Conductors rising vertically shall be supported with conduit kellems grips or equal, in accordance with NEC section 300-19.

<table>
<thead>
<tr>
<th>Cable Vertical Support Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conductor Size</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>12 - 1/0</td>
</tr>
<tr>
<td>2/0 - 4/0</td>
</tr>
<tr>
<td>4/0 - 350 KCM</td>
</tr>
<tr>
<td>500 KCM</td>
</tr>
</tbody>
</table>

3.2 **Field Quality Control**

A. Prior to energization, test cable and wire for continuity of circuitry, and also for short circuits. Correct malfunctions when detected.

B. Check and prove the proper phase rotation of all rotating equipment powered by this network.

C. Subsequent to wire and cable connections, energize circuitry and demonstrate functioning in accordance with requirements. (SEE SECTION ON COMPLETION AND TESTING)

**END OF SECTION**
PART 1 - GENERAL

The contractor shall make all electrical connections relating to the power, lighting and auxiliary systems for this project. Each connection shall be made in such a manner that it will not generate heat and destroy the connecting and/or the insulation on the conductor. All connections shall be made in a skilled craftsman like manner.

1.1 DESCRIPTION OF WORK (STANDARD CONNECTIONS)
A. All connections shall be in compliance with the 75° NEC ratings.
B. The conductors being connected shall be cut of sufficient length to conveniently make a splice - minimum 6 inches.
C. Conductors No. 8 and smaller can be connected with a spring wire connector after the conductors have been mechanically twisted two (2) turns.
D. Conductors No. 6 and larger shall be connected with pressure type terminal lugs of a type hereafter noted.
E. All connections made shall be set in compliance with the lug torque chart in Section 260519.
F. All conductor connections No. 8 and smaller made below a point 24” above grade outside the building shall be made with a non-hardening sealant connector.
G. All conductor connections No. 6 and larger shall be made with water tight connectors.

1.2 PRODUCT DATA
A. Conductors No. 8 and Smaller: Free spring wire connectors made from flame retardant thermo plastic rated at 105°C (221°F), UL Standard 486, CSA LR654-1, Cu/Cy, 600V Intgr. TSB, NSI.
B. Conductors No. 8 and smaller outside building (ground j-box, pole base, etc.) water tight steel spring connectors with water-proof non-hardening sealant, same rating as "A".
C. Conductors No. 8 and Larger (dry locations): Insulated copper rated connectors with Allen wrench set-screw, such as NSI "IT" Series (size to conductors).
D. Multiple conductor connections No. 8 and Larger (dry locations: NSI Series IPL, IPLD, etc.
E. Insulated terminal strips up to 30 Amp, 600V shall be a double terminal block such as NSI Series “TB”, with appropriate mounting hardware.
F. Terminal blocks (size to conductors) such as Square “D” No. CBA363106.

PART 2 - EXECUTION:

2.1 GENERAL
A. All connectors shall be secure in place making a tight electrical connection.

2.2 FIXED EQUIPMENT
A. Terminal strips, terminal blocks shall be firmly secured in place.
SECTION 26 0526
GROUNDING AND BONDING

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK
A. Provide grounding as specified by NEC, as noted herein, and as indicated on drawings. Types of grounding in this section include the following:
1. Underground metal water piping
2. Grounding electrodes
3. Concrete encased electrode (UFER)
4. Service equipment
5. Enclosures
6. Systems
7. Equipment
8. Other items indicated on drawings
B. "G" in the conduit symbol denotes a green ground (to match indicated conductor sizes) which shall be installed in the conduit with other conductors. It shall connect to an insulated ground bar in the panel. (Exception: Main Panel terminations made on ground bar bonded to enclosure).
C. “G” in all conduit, apparatus, equipment, etc. outside the building denotes a #10 bare ground interconnecting all outside equipment having an electrical connection.
D. A green ground conductor shall be installed in all non-metallic conduit runs.
E. Install isolated ground conductors as indicated on the plans.
F. Requirements of this section apply to electrical grounding work specified elsewhere in these specifications.

1.2 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.

1.3 SUBMITTALS
A. None required.

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.
B. Where materials or components are not otherwise indicated, comply with NEC, NEMA and established industry standards for applications indicated.
C. Install an insulated ground bar in branch panels.

2.2 ELECTRICAL GROUNDING CONDUCTORS
A. Unless otherwise indicated, provide electrical grounding conductors for grounding connections matching power supply wiring materials and sized according to NEC.
B. When conductor sizes are increased due to voltage drop (i.e., distance) the ground size shall be increased proportionately in size per NEC.

2.3 GROUND RODS
A. GROUND RODS: Steel with copper welded exterior, 5/8" dia. x 8 ft (quantity as per Code).
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 braided type bonding jumpers with ground clamps on water meter piping to electrically bypass water meter.

C. Install clamp-on connectors only. Thoroughly clean metallic contact surfaces, to ensure electrical conductivity and circuit integrity.

D. 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.

E. Provide a continuous service entrance ground conductor that interconnects the major ground points, namely ground rods (quantity of two, driven exterior to building), by means of bonding to water main, and by means of bonding (Cad-Weld) to building structural steel. If the conductor is not continuous each joint shall be Cad-Welded. The Cad-Weld constitutes a continuous conductor.

F. In addition to all cold water and ground rods provided to meet this specification, each location grounded to water main or ground rod shall have a Concrete Encased Electrode (UFER) ground. A Concrete Encased Electrode (UFER) ground shall consist of a minimum of 20 feet of No. 4 AWG bare copper cable (or per local code) embedded in concrete (feeder encasement, footing, floor slab, etc.) so that all portions of the cable are between 2” and 4” from the earth and with the center of the cable bonded to the ground rod or pipe.

G. See drawings for additional grounding requirements.

END OF SECTION
SECTION 26 0533
RACEWAYS FOR ELECTRICAL SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK
A. Extent of raceways in 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. (below grade only w/RMC elbows)
C. Prohibited Raceway Materials:
   1. Aluminum conduit.
   2. Electrical Nonmetallic Tubing (ENT) conduit.
   3. Armored cable type AC (BX) cable.
   4. Metal-clad cable type MC cable.
D. Prohibited Fitting Materials:
   1. Crimp-on, tap-on, indenter type fittings.
   2. Cast set-screw fittings for EMT.

1.2 QUALITY ASSURANCE
A. MANUFACTURERS: Firms regularly engaged in the 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. MINIMUMS: As a minimum, conduit sizes shall be as per NEC Tables 3A, 3B, and 3C or as shown on plans. Minimum conduit size shall be 3/4". Minimum home run size shall be 3/4". Electrical contractor shall not modify the wiring arrangement without prior approval from Engineer.

1.3 SUBMITTALS
A. Not required.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING
A. GENERAL: Provide metal conduit, tubing and fittings or types, grades, sizes and weights (wall thicknesses) as indicated; with minimum trade size of 3/4".
B. Control system conduit indicated on plan shall be installed as shown with 3/4" being the minimum size.
C. RIGID METAL CONDUIT (RMC): FS WW-C-0581 and ANSI C80.1.
D. INTERMEDIATE STEEL CONDUIT (IMC): RS 22-C-581.
F. RIGID AND INTERMEDIATE STEEL CONDUIT FITTINGS: Provide fully threaded malleable steel couplings; raintight and concrete tight where required by application. Provide double locknuts and metal bushings at conduit terminations, us OZ Type B bushing on conduits 1-1/4" and larger.
G. ELECTRICAL METALLIC TUBING (EMT): FS WW-C-563 and ANSI C80.3.
H. EMT FITTINGS: Provide install set-screw type malleable steel fittings: connectors shall be insulated throat type, concrete tight where required by application. Install OZ Type B bushings on conduits 1-1/4" and larger.

I. FLEXIBLE METAL CONDUIT: FS WW-C-566, of the following type:
   1. Zinc-coated steel.

J. FLEXIBLE METAL CONDUIT FITTINGS: FS W-F-406, Type 1 Class 1, and Style A.

K. LIQUID-TIGHT FLEXIBLE METAL CONDUIT: 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). Type UA and/or NMLT-B non-metallic.

L. LIQUID-TIGHT FLEXIBLE METAL CONDUIT FITTINGS: FS W-F-406, Type 1, Class 3, Style G and/or fittings to match the specified non-metallic conduit noted above.

M. EXPANSION FITTING: OZ Type AX, or equivalent of suit application.

2.2 NON-METALLIC CONDUIT AND DUCTS (Below grade only, shroud with concrete where indicated.

A. GENERAL: Provide non-metallic conduit, ducts, and fittings of types, sizes and weights (wall thicknesses) as indicated shall not be installed inside the building, except it be encased in concrete and there it shall surface through a RMC elbow; with minimum trade size of 3/4". (In this specification, it is not permitted above grade for any reason.)

B. UNDERGROUND PVC PLASTIC UTILITIES DUCT: ANSI/NEMA TC 6, Type 1 for encased burial in concrete, Type II for direct burial.
   1. PVC AND ABS PLASTIC UTILITIES DUCT FITTINGS: ANSI/NEMA TC9, match to duct type and material.
   2. CONDUIT, TUBING, AND DUCT ACCESSORIES: Provide conduit, tubing and duct accessories of types, sizes, and materials, complying with manufacturer's published product information, which mate and match conduit and tubing.

C. SEALING BUSHINGS: Provide OZ Type FSK, or FSKA.

D. SPECIAL GROUND: To maintain the building ground continuity, a NEC size ground shall be installed in each non-metallic conduit run, where the system voltage is greater than 48-volts.

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.

B. FEEDERS UNDER 600 VOLTS: Install feeders to panels and motor control centers and individual equipment feeders rated 100 amps and greater, in rigid metal conduit (RMC), or intermediate metal conduit (IMC); except where buried below grade, install in non-metallic conduit or duct. Feeders 1-1/2" round and larger shall be encased in concrete as a part of the floor. Not up in the floor, but just below the floor with the top of the conduit touching the bottom of the slab and the bottom of the conduit being covered with at least 1" of concrete.

C. Feeders below grade shall be installed in RMC and/or PVC conduit shrouded with a minimum of 3" cover of red concrete with a #3 rebar in opposite corners. The top of the duct bank shall be set 48-inches below finish grade.

D. BRANCH CIRCUITS, SIGNAL AND CONTROL CIRCUITS, AND INDIVIDUAL EQUIPMENT CIRCUITS RATED LESS THAN 100 AMPS: Install in electric metal tubing (EMT); except in poured walls, floor slabs, below concrete slab-on-grade, or in earth fill, install in non-metallic plastic duct. Encase non-metallic plastic duct 1-1/4" and larger in concrete.

E. Coordinate with other work, including metal and concrete deck work, as necessary to interface installation of electrical raceways and components.

F. When non-metallic conduit is used it shall come to the surface in a RMC elbow or box.

G. Coordinate the campus ground equipment installation with existing structures, trees, lawn sprinkler systems, etc.

H. Install raceway in accordance with the following:
   1. Provide a minimum of 12" clearance from flues, steam and hot water piping, etc.
2. Conceal raceways in finished walls, ceilings and floors (other than slab-on-grade). Where conduit is exposed in mechanical spaces, etc., install parallel with or at right angles to building or room structural lines.

3. Where cutting raceway is necessary, remove all inside and outside burrs; make cuts smooth and square with raceway.

4. **Flexible raceways shall not be concealed in construction and where installed the run shall be limited to 10 feet in length.**

5. Comply with NEC for requirements for installation of pull boxes in long runs.

6. All raceways shall terminate in a connection and/or bushing.

### 3.2 NORMAL INSTALLATIONS

A. Cap open ends of conduits and protect other raceways as required against accumulation of dirt and debris. Pull a mandril and swab through all conduit before installing conductors. Install a 200 lb. nylon pull cord in each empty conduit run.

B. Replace all crushed, wrinkled or deformed raceway before installing conductors.

C. Provide rigid metal conduit (RMC) for all bends in buried conduit greater than 30 degrees.

D. Provide a protective coating for RMC bend as specified herein.

E. Where raceways penetrate building or vault walls and floors below grade, install rigid metal conduit (RMC) for a minimum distance of 10 ft. on the exterior side of the floor or wall. Provide OZ, Type FSK or WSK sealing bushings (with external membrane clamps as applicable) for all conduit penetrations entering building or vaults below grade.

F. Install liquid-tight flexible conduit for connection of motors, transformers, and other electrical equipment where subject to movement and vibration.

G. Install five spare 3/4" conduit (capped) from each flush branch panelboard into the ceiling and floor space. Where the floor is not accessible run ten conduits into the ceiling space. Run conduits the required distance necessary to reach accessible ceiling space.

H. Provide OZ expansion fittings on all conduits crossing building expansion joints, both in slab and suspended.

I. Complete installation of electrical raceways before starting installation of cables/conductors within raceways.

J. All conduit that penetrates the roof shall be flashed with a factory jack, see Section 260501 - 3.1(G).

### 3.3 GROUNDING

A. All metal conduit terminations shall be equipped with a grounding bushing.

B. To maintain the continuity of the building ground network, install a code size ground conductor in all non-metallic conduit.

### 3.4 PROHIBITED PROCEDURES

A. Use of wooden plugs inserted in concrete or masonry units for mounting raceway, supports, boxes, cabinets, or other equipment.

B. Installation of raceway which has been crushed or deformed.

C. Use of torches for bending PVC.

D. Spray applied PVC cement.

E. Boring holes in truss members.

F. Notching of structural members.

G. Supporting raceway from ceiling system support wires.

H. Nail drive straps for supporting raceway.

### 3.5 EXCAVATION AND BACKFILL

A. **RACEWAY INSTALLATION BELOW SLAB-ON-GRADE, OR BELOW GRADE:**

B. The Electrical contractor is responsible for all excavation and backfill related to the electrical installation defined herein and/or as indicated on the plans.

C. **UNDERGROUND RACEWAY AND CONDUIT:**

1. Bury underground raceway installed outside building 24 inches deep minimum.

2. Wrap buried galvanized rigid steel and galvanized IMC conduit and fittings with vinyl tape where in contact with earth or concrete.

3. Opening of finished surfaces asphalt concrete, grass, etc. shall be accomplished by first identifying the limits of the opening then cut within the limits preserving the undisturbed areas. Asphalt shall be cut with a wedging tool, concrete with a diamond saw and grass with a cutter.
4. Excavation shall be accomplished with the proper equipment, protective care shall be taken to not disturb the adjacent surfaces and materials. This contractor is responsible and shall protect all material objects and things adjacent to the excavation.

5. All materials not reinstalled in the installation shall be removed from the premise.

6. Backfill the first six (6) inch layer over the installed subject (conduit, cable, etc.) shall be sand. Subsequent six (6) inch layers shall be loan soil. Each layer shall be compacted to a 90% standard proctor test before the next layer is applied. (Refer to Section 260533, Part 3 for conduits required to be incased in concrete).

7. For slab-on-grade construction, install runs or rigid plastic conduit (PVC) below slab. Install RMC (with protective coating) for raceways passing vertically through slabs on grade. Slope raceways as required to drain away from electrical enclosures and to avoid collection of moisture in raceway low points.

8. 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.

9. 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.

10. Conduits encased in concrete shall be shrouded with a 3" of Red concrete. Install a #3 rebar in opposite corners of the encasement except for two conduits or less where two #3 bars in opposite corners is acceptable.

D. RACEWAY INSTALLATION IN SUSPENDED SLABS:

1. Install conduit as close to the middle of concrete slab as practicable without disturbing reinforcement. Do not install conduits of diameter greater than 1-1/4" of the slab thickness. Space conduits not less than 3 diameters on center (except at stub up locations). Provide OZ expansion fittings at all expansion joints. All raceways shall be installed with concrete tight fittings.

2. Install RMC in all hazardous locations as defined by NEC. Provide suitable fittings, seal-offs, boxes, etc. to comply with requirements.

END OF SECTION
SECTION 26 0534
BOXES, PULL BOXES, CONDUIT BODIES AND FITTINGS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK
A. Extent of electrical box and electrical fitting work is indicated by drawings and schedules.
B. Types of electrical boxes, fittings, etc. in this section, or noted on the plans shall include the following:
   1. Outlet boxes
   2. Junction boxes
   3. Conduit bodies
   4. Bushings
   5. Locknuts
   6. Knockout closures
   7. Miscellaneous boxes and fittings

1.2 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.

1.3 SUBMITTALS
A. None required.

PART 2 - PRODUCTS

2.1 FABRICATED MATERIALS
A. INTERIOR OUTLET BOXES: Provide one piece, galvanized flat rolled sheet steel interior outlet wiring boxes, 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 covers and wiring devices; standard box shall be 4” square x 2-1/8” deep, (Raco 231) with 3/4” knock outs and tile or masonry/type box extensions (Raco 843).
B. If the structure will not allow a 4 square box use a 3” deep single gang unit (Raco 695).
C. In spaces with restricted width, like between a door frame and window jam, use partition boxes (Raco 426).
D. INTERIOR OUTLET BOX ACCESSORIES: Provide outlet box accessories as required for each installation, including mounting brackets, hangers, masonry 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. See the details on the plans.
E. WEATHERPROOF OUTLET BOXES: Provide corrosion-resistant cast-metal weatherproof outlet wiring boxes, of types, shapes and sizes (including depth) required, with threaded conduit ends, cast-metal face application, with face plate gaskets and corrosion-resistant fasteners.
F. JUNCTION AND PULL BOXES: 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. J-box larger than 8 x 8 x 6 shall have a hinged cover.
G. CONDULET BODIES (FITTINGS): 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.
I. BUSHINGS, KNOCKOUT CLOSURES AND LOCKNUTS: Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts and malleable iron conduit bushings and offset connectors, or types and sizes to suit respective uses and installation.
2.2 FITTINGS
A. The contractor shall provide all sheet metallic connectors, coupling, etc., a needed on this project.
B. When installing non-metallic sheathed cable, all connections to boxes, cabinets, etc., shall be made with screw steel fittings with a locknut connection to the box.

PART 3 - EXECUTION

3.1 INSTALLATION
A. Interface with other work.
B. Coordinate location of outlets adjacent to or in millwork with Division 06 before rough-in. Refer conflicts to Architect and locate outlet under his direction.
C. Coordinate with Division 23 for installation of exposed raceway in mechanical equipment areas. Exact separation of responsibility is shown on Drawings.
D. Mount switch boxes with long dimension vertical.
E. Mount receptacle boxes with long dimension vertical.
F. Boxes shall be accessible and installed with approved cover.
G. Locate boxes so outlets are not obstructed by pipes, ducts, or other items.
H. Install outlets flush with finished surface and level and plumb.
I. Boxes for switches shall generally be located within 6 inches of door jamb.
J. Properly center single outlets in each room. Where two or more outlets occur, space them uniformly and in straight lines with each other.
K. Support switch boxes larger than two-gang with side brackets and steel bar hangers in framed walls.
L. HVAC Instrumentation and Control System: Boxes installed by mechanical contractor.
M. 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.
N. Minimum height of wall receptacles shall be 18". With the box arranged for vertical mounting of the receptacles (neutral slot at the left).
O. Coordinate installation of electrical boxes and fittings with wire/cable and raceway installation work.
P. Provide coverplates for all boxes. See Section 260534, Wiring Devices.
Q. Provide weatherproof outlets for interior and exterior locations exposed to weather or moisture.
R. Provide knockout closures or cap unused knockout holes where blanks have been removed.
S. Install boxes and conduit bodies to ensure ready accessibility of electrical wiring. Install recessed boxes with face of box or ring flush with adjacent surface so the device mounting flange sets on the box mounting plate. This will cause the device and coverplate surfaces to match.
T. 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.
U. Provide electrical connections for installed boxes.

END OF SECTION
SECTION 26 0548
ELECTRICAL SUPPORTS AND SEISMIC RESTRAINTS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK
A. All electrical equipment, distribution panels, motor control centers, conduit, device boxes, apparatus, etc., shall be securely anchored and/or supported in place as specified herein and/or in accordance with state, local, and seismic codes.

1. 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 hold conduit straps, offset conduit clamps, expansion anchors, toggle bolts, threaded rods, U-channel strut systems, and all associated accessories.

2. Quality Assurance: Comply with NEC and local codes 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.

3. Manufactured Supporting Devices and Raceways: Provide manufactured mounting brackets (such as Caddy #SDG or SDB - D - 16); 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 drawing details for additional requirements.

4. Tie-wire is not acceptable.

5. Supporting of equipment may be noted in other sections of the specifications.

B. Wall supported equipment shall be mounted on an angle support bracket with anchors into or through the wall as perimeter (the latter mounting is preferred, but must be approved by the architect), with two 1/2” rods up to the structure from the outer most corners of the mounting frame tied-off to the building structure. This would be likened unto a transformer. Wall mounted electrical panels shall be mounted directly to the wall.

C. For hanging of conduit, see Section 260533.

D. Installation of Supporting Devices for all types of Raceways: 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.

1. Coordinate with other electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices with other work.

2. 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.

3. RACEWAYS (ALL TYPES): Support raceways which are rigidly attached to structure at intervals not to exceed 8 feet on center and within 12” of each junction box, outlet or fitting. Support raceway (as it is installed) in accordance with the following:

<table>
<thead>
<tr>
<th>NUMBER OF RUNS</th>
<th>MIN. 3/4&quot; TO 1-1/2&quot;</th>
<th>1-1/2&quot; &amp; LARGER</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Full straps, clamps</td>
<td>Hanger</td>
</tr>
<tr>
<td></td>
<td>or hangers.</td>
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</tr>
<tr>
<td>2</td>
<td>Full straps, clamps</td>
<td>Mounting Channel</td>
</tr>
<tr>
<td></td>
<td>or hangers.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Mounting Channel</td>
<td>Mounting Channel</td>
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</tbody>
</table>

4. Support suspended raceways on trapeze hanger system, 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.
5. 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
6. Coordinate with other work, including metal and concrete deck work, as necessary to interface installation of electrical raceways and components.
7. Coordinate the campus ground equipment installation with existing structures, trees, lawn sprinkler systems, etc.
8. Install raceway in accordance with the following:
   a. Provide a minimum of 12” clearance from flues, steam and hot water piping, etc.

E. BURIED CONDUIT: Conduit installed in the earth shall be laid on undisturbed soil and/or compacted fill. The first six (6) inches of cover shall be sand. See Excavation and Backfill - see Section 260533-3.6.

F. Concrete slabs, bases, curbs, etc., for electrical apparatus shall be provided and installed under this contract. The concrete shall be 5-bag mix, except as noted.
   1. The contractor shall provide and install an 8 x 8 x 4 concrete base for the transformer (confirm size and depth with the service utility) at the indicated location.
   2. Unless otherwise noted, provide a 4” high concrete base for all main panels, motor control centers, transformers, engine generators, etc. Extend base 4” beyond equipment or mounting rails on all sides or as shown on the drawings. Coordinate the pad dimension with the equipment to be located thereon.
   3. Concrete pole bases (detailed on the plans) shall be provided under Division 26. Coordinate size and location of all bases and furnish all required anchor bolts, sleeves and templates as required to obtain a proper installation.
   4. All concrete used on this project shall be 5-bag mix and/or as specified in the concrete section of the Architectural Section.

PART 2 - SEISMIC BRACING

2.1 GENERAL
   A. The General Conditions, Supplementary General Conditions, Alternates and Addenda, Applicable Drawings and the Technical Specifications shall apply to all work under this division.
   B. This seismic bracing section shall conform to the conditions governing the area within the structure being built under local and/or state UBC Seismic Requirements.

2.2 SCOPE OF WORK
   A. The materials covered by these specifications consist of furnishing all labor, material and equipment necessary to complete the seismic bracing for all work provided under section 260000.
   B. The work shall include all electrical isolated and non-isolated equipment, luminaires, raceways, etc.

2.3 CODES - REGULATIONS
   A. In the installation of this work, comply in every way with the requirements of the laws, ordinances and rules of the system design and installation shall be based on seismic zone III of the Uniform Building Code, current edition and other standards listed below.
   B. Reference Standards:
      1. Uniform Building Code current edition, especially Sec. 2336
      2. NFPA bulletin 90A, current edition
      3. UL Standard 181
      4. Tri-services manual, fagel etal 1978
   C. If a conflict occurs between these rules and this specification, the rules are to govern. Accept this condition upon submitting 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 on the plans or specifications which may be in excess of requirements of the hereinbefore mentioned rules and not contrary to same. Contractor shall bear all costs arising from the installation of any materials or equipment which is in conflict with the above mentioned codes or ordinances.
D. Obtain approvals, inspections, etc., required by code. All fees shall be included in the contract price. The contractor shall furnish a certificate of approval to the Owner's Representative from the inspection authority at completion of the work.

2.4 MATERIALS AND WORKMANSHIP

A. All materials and equipment furnished and installed shall be first quality, new and meet the standards of NEMA, IPCEA, LS, UL, NFPA, UBC, UOSH, NEC, and shall bear their label wherever standards have been established and label service is available. Where materials and equipment are specified by manufacturer's name, and type and quality required is thereby denoted. The Owner's Representative shall be afforded every facility, deemed necessary to inspect and examine the materials and apparatus being installed to provide their quality, skill and competency of workmanship.

B. Workmanship shall be the best quality of its kind for the respective industries, trades, crafts and practices and shall be acceptable in every respect to the Owner's Representative. Nothing contained herein shall relieve the contractor from making good and perfect work in all details of construction.

C. The contractor shall work in harmony with the Owner's Representative and with other contractors, companies or individuals working in connection with this project. Imperfections or errors by other contractors shall not relieve responsibility of this contractor. Store materials orderly and clean up without interference.

2.5 QUALITY ASSURANCE

A. The contractor shall be held responsible for purchasing and installing vibrator isolators, flexible connections, rigid steel frames, concrete inertia bases, anchors, inserts, hangers, and attachments, seismic bracing and snubbers as required for seismic control and prevention of the transmission of vibration for both isolated and non-isolated systems.

B. Manufacturers and suppliers approved for use by the contractors Mason Industries, Inc., Korfund, and Amber/Booth Company.

C. The approved manufacturer or supplier shall be totally responsible for the fabrication and operation of the seismic bracing components specified herein for all isolated equipment, non-isolated equipment, luminaires, raceways, etc.

2.5 GUARANTEE

A. The entire electrical system installed under this contract shall be left in proper working order and be in compliance with the drawings, specifications and/or authorized changes to the satisfaction of the Owner's Representative. Without additional charge, replace any work or materials which develop defects, except from ordinary wear, within one year from the date of substantial completion. A written guarantee covering the above provisions shall be signed and delivered to the architect after the project has final acceptance by the inspecting authority.

PART 3 - PRODUCTS

3.1 NON-ISOLATED EQUIPMENT, RACEWAYS, ETC.

A. All non-isolated equipment shall be installed according to current Uniform Building Code Sec. 2312 (g): Cp Factor Table 23J, I Factor Table 23K. In addition the vertical forces, restraint requirements shall be computed as .5g the value of the lateral forces.

B. All non-isolated raceway shall be protected against seismic disturbances except as noted below:
   1. All electrical conduit less than 2” inside diameter.

PART 4 - EXECUTION

4.1 SEISMIC REQUIREMENTS

A. All electrical work shall be braced, snubbed or supported to withstand seismic disturbances and remain operational. Furnish all labor, materials and equipment to provide protection against seismic disturbances and remain in place.
4.2  **SHOP DRAWING SUBMITTAL AND REVIEW**

A. Submit complete, bound submittal in a loose-leaf binder large enough for all items (8 copies) to architect after award of contract. All such submittals shall include, but are not necessarily limited to, the following:

1. Complete engineering calculations and shop drawings, prepared and stamped by a licensed engineer (UBC 302-6) for all seismic requirements for all equipment that is to restrain raceways, etc.
2. The type, size and deflection of each isolator proposed for items in this specification and on the drawings.
3. Details for all the isolators and seismic bracing with snubber proposed for items in this specification and on the drawings.
4. Details for steel frames and concrete inertia bases to be used in conjunction with the isolation of the items in this specification and drawings.
5. Clearly outlined procedures for installing and adjusting the isolators, seismic bracing and snubbers.
6. The size, loading and location of raceway supports with either a plan or complete description of the system.

B. All items must be submitted at the same time. Partial submittals will not be accepted. Binders and indexes will remain in possession of engineer, architect, contractor and sub-contractor.

C. Review is for assistance and interpreting the design concept. Changes in requirements will not be made in the review process. Review action does not exempt requirements to meet the intent of the contract documents. Any changes will be made by change order. Items not included in the submittal or incorrectly selected shall be in accordance with the contract requirements.

**END OF SECTION**
SECTION 26 0553
ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The Electrical Contractor is responsible for the labeling of all electrical equipment for this project. The labels shall be made on one-eighth inch laminated micarta and an engraving machine as stated below.

B. Labeling and Engraving: Any and all electrical control equipment shall be labeled with an engraved black Micarta with white core labels, 1/16” thick, shall be bolted on the interior and the exterior of branch panels (panel name and voltage) and the exterior of disconnect switches, motor controls, major J-boxes (power and auxiliary), push buttons, thermal switches, time switches and similar equipment. The labels shall have 1/4” high engraved letters, such as 1-1/2 HP FAN, PANEL - A. All main panel circuits shall be identified with Micarta labels.

C. The phase of each feeder conductor shall be color coded at each end in panels and junction boxes as stated in Section 260519 - 2.1. The feeder powers shall be attached to the bundle of cables with a tie-wrap.

D. Conduit shall be installed as diagramed on the plan. Any deviation shall be authorized in writing prior to rough-in.

E. Write with a felt tip pen that contains permanent ink, on the inside of each device box and on the back of every plate, the circuit to which the device is connected. Example: Circuit “A-1”.

F. Engraving device plates - see WIRING DEVICES.

END OF SECTION
SECTION 26 2416
PANELBOARDS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK
A. Extent of panelboard and enclosure work, is indicated by drawings and schedules.
B. Types of panelboards and enclosures in this section include lighting and appliance panelboards, and power distribution panelboards.

1.2 QUALITY ASSURANCE
A. Provide units which have been UL listed and labeled. Comply with NEC as applicable to installation of panelboards, cabinets, and cutout boxes. Comply with NEC pertaining to installation of wiring and equipment in hazardous locations. Comply with NEMA Stds. Pub. No. 250, "Enclosures for Electrical Equipment (1000 volt maximum)". Pub. No. 1, "Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less".

1.3 SUBMITTALS
A. PRODUCT DATA
   1. Submit manufacturer data including specifications, installation instructions and general recommendations, for each type of panelboard required.
B. SHOP DRAWINGS
   1. Submit dimensioned drawings of panelboards and enclosures showing accurately scaled layouts of enclosures and required individual panelboard devices, including, but not necessarily limited to, circuit breakers, fusible switches, fuses, ground-fault circuit interrupters, and accessories.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Subject to compliance with requirements, provide products of one Square "D" Company - NQ, NF, or I-Line Type.
B. Approved Manufacturers
   1. Square "D" Company
   2. General Electric Company
   3. Siemens
   4. Eaton

2.2 PANELBOARDS
A. GENERAL
   1. Except as otherwise indicated, provide panelboards, enclosures and auxiliary components, of types, sizes, and ratings indicated. Equip with number of unit panelboard devices as required for complete installation. Fully equip "spaces" with hardware to receive breaker or switch of size indicated.

2.3 LIGHTING AND APPLIANCE PANELBOARDS
A. Provide dead-front safety type lighting and appliance panelboards as indicated, with switching and protective devices in quantities, ratings, types and arrangement shown, provide bolt-on thermal magnetic type branch breakers. Where multiple breakers are indicated, provide with common trip handle. Equip with aluminum bus bars full-sized neutral bus, ground bus and isolated ground bar when indicated.
2.4 PANELBOARD ENCLOSURES
   A. Provide galvanized sheet steel cabinet type enclosures, in sizes and NEMA types as indicated, code-gauge minimum 16-gauge thickness. Provide fronts with adjustable indicating trim clamps, and doors with flush locks and keys, all panelboard enclosures keyed alike, with concealed door hinges and door swings as indicated. Equip with interior circuit-directory frame, and card with clear plastic covering. Provide baked gray enamel finish over a rust inhibitor. Provide enclosures fabricated by same manufacturer as overcurrent devices contained therein. Bolt engraved formica labels indicating panel name and voltage on the interior and exterior of panelboards.

2.5 FINISH
   A. Coat interior and exterior of surface with manufacturer’s standard color; baked on enamel finish.

2.6 IDENTIFICATION
   A. Provide 1/16” thick black Formica labels with 1/4” high lettering on the interior and exterior of each panelboard; include panelboard name and voltage - see Section 260553.

2.7 BRANCH CIRCUIT BREAKERS
   A. Provide and install branch circuit breakers of the size, type and amperage indicated, mounted in the position noted in the panel schedule. The circuit breakers shall be as defined by NEMA as a device designed to carry electric current through a set of contacts and by automatic means open the contacts, interrupting the flow of current when the flow of current exceeds the labeled rating or on a high instantaneous inrush of current. The tripped breaker shall flag the interruption of the flow of current and be capable of being reset when returned to normal operating temperature. The breaker shall be a molded case unit that will open on an overload and/or short-circuit condition. The unit shall be constructed as molded case units having a single handle operator for one, two or three pole units. For multiple pole units, and overload on any pole shall cause all terminals to open.

PART 3 - EXECUTION

3.1 GENERAL
   A. Install panelboards and enclosures where indicated, in accordance with manufacturer’s written instructions, applicable requirements of NEC and NECA’s “Standard of Installation”, in compliance with recognized industry practices to ensure products fulfill requirements.
   B. Position the breakers in the panel to match the schedule on the plans.
   C. Coordinate installation of panelboards and enclosures with cable and raceway installation work. Anchor enclosure firmly to walls and structural surfaces, ensuring they are permanently and mechanically secure. Arrange conductors neatly within enclosure, and secure with suitable nylon ties.
   D. Fill out panelboard’s circuit directory card upon completion of installation work. Utilize actual final building room numbers, not architectural numbers used on drawings. Identify individual lighting circuits and individual receptacle circuits by room served. Include room number with equipment circuit designations. All directories to by typewritten.
   E. Provide selective coordination of all breakers per NEC 700.27 and 701.27 Using the definition in Article 100 (NEC2014).

END OF SECTION
SECTION 26 2726
WIRING DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK
A. The extent of wiring device work is indicated by drawings and schedules. Wiring devices are defined as a unit of an electrical system that carries or controls electric energy as its principal function.
B. Types of electrical wiring devices in this section include the following:
   1. Switches
   2. Receptacles
   3. Wiring device accessories

1.2 QUALITY ASSURANCE
A. Comply with NEC and NEMA standards as applicable for construction and installation of electrical wiring devices. Provide electrical wiring devices which have been UL listed and labeled.

1.3 SUBMITTALS
A. PRODUCT DATA: Submit manufacturer's data on electrical wiring devices.

PART 2 - PRODUCTS

2.1 FABRICATED WIRING DEVICES
A. GENERAL: Provide factory-fabricated wiring devices, in types, and electrical ratings for applications indicated and complying with NEMA Stds. Pub. No. WD 1. The devices shall be white with white coverplates.
B. Provide wiring devices (of proper voltage rating) as follows:

<table>
<thead>
<tr>
<th>SWITCHES</th>
<th>(20A Continuous Rating)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MFGR.</td>
<td>1-Pole</td>
</tr>
<tr>
<td>Hubbell</td>
<td>DS120W</td>
</tr>
<tr>
<td>P&amp;S</td>
<td>2621W</td>
</tr>
<tr>
<td>Leviton</td>
<td>5621-2W</td>
</tr>
<tr>
<td>Eagle</td>
<td>7622W-Box</td>
</tr>
<tr>
<td>Bryant</td>
<td>9901W</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RECEPTACLES</th>
<th>(20A Continuous Rating)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MFGR.</td>
<td>C.O.’s</td>
</tr>
<tr>
<td>Hubbell</td>
<td>SNAP5362W A/SNAP2RA</td>
</tr>
<tr>
<td>P&amp;S</td>
<td>EQUAL</td>
</tr>
<tr>
<td>Leviton</td>
<td>EQUAL</td>
</tr>
<tr>
<td>Eagle</td>
<td>EQUAL</td>
</tr>
</tbody>
</table>
C. Special devices as indicated on the plans, complete with stainless steel coverplates shall be provided and installed where indicated.

D. All weatherproof covers on receptacles (GFI) and/or switches shall be mounted on a recessed box. Cover shall be made of cast aluminum such as Arlington Industries #DSHBIBRC. Equals of T&B and TayMac are acceptable. GFI receptacle shall be weather resistant as indicated in schedule above.

E. Provide devices in colors selected by Architect.

2.2 WIRING DEVICE ACCESSORIES

A. WALL PLATES: Provide and install stainless steel coverplates for all wiring devices. Engrave all receptacle plates other than those serving 120 volt, single phase devices. State voltage and amperage characteristics. Example: "208V, 30A".

B. All switch banks shall have each switch identified as to its function with 1/8" thick laminated micarta engraved adhesive plate.

C. Weatherproof coverplates shall be Arlington Industries #DSHBIBRC. Equals of T & B and TayMac are acceptable.

PART 3 - EXECUTION

3.1 GENERAL

A. Install wiring devices as indicated, in compliance with manufacturer's written instructions, applicable requirements of NEC, NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.

B. Coordinate with other trades (including painting), the installation of electrical boxes and wiring. 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 coordinated with other work. Verify all dimensioned items on job site. Consult architectural cabinet, millwork, and equipment shop drawings prior to rough-in of electrical work.

C. Receptacles: The receptacles shall be mounted vertically with the neutral terminal or slot at the left side.

D. Install devices only in electrical boxes which are clean; free from excess building materials, dirt, and debris. Mark each box and the back of each device plate, with felt tip marker, indicating the circuit or port to which the device is connected. Example: "CKT A-1".

E. Install blank plates on all boxes without devices.

F. Delay installation of wiring devices until wiring work is completed. Delay installation of wall plates until after painting work is completed.

G. Do not Edison or share neutral conductors between phases.

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 electrical continuous, tight grounding connections for wiring devices, unless otherwise indicated.

3.4 TESTING

A. Prior to energizing circuitry, test with a hand test device that proves electrical connections: continuity, proper polarity, grounding, neutral connection, etc. Any irregularities shall be corrected.

END OF SECTION
SECTION 26 5100
INTERIOR LIGHTING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK
A. Extent of interior and exterior luminaire work is indicated by drawings and schedules.
B. The contractor shall provide the quantity of luminaires indicated on the plans. The drawn length (in standard increments) of the luminaire determines the quantity and the catalog number identifies the model or type. The catalog numbers have been carefully prepared to define the luminaire type, but may not be completely accurate. At least four (4) days prior to bidding each manufacturer shall compare the catalog numbers shown with the description and requirements on the drawings and shall notify the Architect/Engineer of any discrepancies. Specifically included in the evaluation shall be the verifying of proper mounting kits or accessories to facilitate installation of the luminaire as shown at each location on the plans. No allowance or redress will be allowed for discrepancies that were not addressed to the indicated authorities for clarification prior to bidding. Reporting of ambiguities is the responsibility of the bidder.
C. Types of light sources within the luminaires include the following:
   1. LED

1.2 QUALITY ASSURANCE
A. Comply with NEC (Article 410), NEMA and ANSI 132.1 as applicable to installation and construction of luminaires. Provide UL listed and labeled luminaires for installation on this project.

1.3 SUBMITTALS
A. PRODUCT DATA: Submit manufacturer's data on interior and exterior building luminaires. Submit the manufacturer's data on ballasts supplied with luminaires.
B. SHOP DRAWINGS: Submit dimensioned drawings of luminaires and supplied ballasts. Submit luminaire shop drawings with ballasts in booklet form with separate sheet for each luminaire, assembled in "type" alphabetical order, with proposed luminaire/accessories clearly indicated on each sheet.
C. Submit manufacturer's contact information for future LED module/driver replacement by owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS
A. Subject to compliance with requirements, provide products of one of the following (for each luminaire):
   1. LED lamps

2.2 INTERIOR LUMINAIRES
A. GENERAL: Provide luminaires, of sizes, types and ratings indicated. Luminaire shall be complete with, but not necessarily limited to, housings, lamps, lamp holders, reflectors, ballasts, starters and wiring. Label each luminaire with manufacturer's name and catalog number. Provide all enclosed luminaires with positive latch mechanisms; spring tension clips not acceptable. Provide all exterior luminaires with damp or wet location label as required by application.
B. SUPPORT REQUIREMENTS: Provide all pendant and stem mounted luminaires with flexible ball joint hangers at all points of support. Equipment hooks used to hang luminaires shall be supplied with safety latches. Provide all detachable luminaire parts, luminous ceiling accessories, louvers, diffusers, lenses, and reflectors with locking catches, screws, safety chain or safety cable. Each hanger point shall be capable of supporting four times the luminaire weight. Backing supports shall be installed above (or behind) sheetrock, plaster and similar ceiling and wall materials. All surface mounted ceiling luminaires shall be supported from a structural channel. See plans for additional details.
2.4 LED DRIVERS/LAMPS
   A. 5 year warranty; lamps (4000-4500K). See additional information on Sheet E2.0.

PART 3 - EXECUTION

3.1 INSTALLATION OF LUMINAIRES
   A. Install luminaires at locations and heights indicated, in accordance with luminaire manufacturer's written instructions, applicable requirements of NEC (Article 410), NECA's "Standard of Installation", NEMA standards, and with recognized industry practices to ensure that luminaires fulfill requirements.
   B. Coordinate with other work as appropriate to properly interface installation of luminaires. Consult architectural reflected ceiling plan for exact location of all luminaires.
   C. Provide all necessary supports, brackets, and miscellaneous equipment for mounting of luminaires. Support all ceiling mounted luminaires from the building structure; independent of the ceiling system, unless noted. Support each recessed luminaire from the building structure with #12 ga. steel wire attached to each luminaire 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 ceiling mounted outlet boxes independent of the raceway system, and capable of supporting 200 pounds. See plans for additional details.
   D. Install LED emergency battery inside luminaire driverchannel with charging indicator light and test switch mounted on luminaire end, or visible and accessible through lens. Wire so luminaire can be tested with lights on and lamps in normal mode are switched off with other lighting in area. Connect emergency battery to unswitched conductor.
   E. Clean luminaires of dirt and debris upon completion of installation.
   F. Protect installed luminaires from damage during remainder of construction period. Repair all nicks and scratches to appearance of original finish. If repair is not possible, replace damaged portion of luminaire.

3.2 FIELD QUALITY CONTROL
   A. Upon complete installation of luminaires, and after building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning luminaires on site, then reset to demonstrate compliance; otherwise remove and replace with new luminaires, and proceed with retesting.
   B. At the time of Substantial Completion, replace lamps in interior luminaires which are observed to be noticeably dimmed after the Contractor's use and testing, as judged by Architect/Engineer. In addition, furnish replacement lamps amounting to 15 percent (but not less than one lamp) of each type and size used (Max. 48 of any one type). Deliver replacement stock with letter of transmittal as directed to Owner's storage space.
   C. Provide tight equipment grounding connections for each luminaire.

END OF SECTION
SECTION 26 5200
EMERGENCY LIGHTING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK
   A. Furnish and install emergency batteries as described in Contract Documents at the designated locations.
   B. All fixtures noted with “B” in type number as well as others indicated by keynote #1 shall be circuited directly or through a relay to an emergency panel.

PART 2 - PRODUCTS

2.1 EQUIPMENT
   A. Batteries
      1. General
         a. Batteries shall be long life nickel cadmium type.
         b. Complete with charging indicator light and test switch.
         c. Factory-installed in luminaire, or capable of being field-installed to same standards.

PART 3 - EXECUTION

3.1 INSTALLATION
   A. Batteries
      1. General
         a. Wire so luminaire can be tested with lights on.
         b. Wire so lamps in normal mode are switched off with other luminaires in area.
            Connect unit to unswitched conductor of normal lighting circuit.
      2. Recessed Downlight Fluorescent Luminaires: If indicator light and test switch cannot be installed within fixture, install on plate adjacent to luminaire.
      3. Other fluorescent Luminaires: Install battery ballast in ballast channel of luminaire with charging indicator light and test switch mounted on luminaire end, or visible and accessible through lens.

END OF SECTION
SECTION 26 5600
EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK
A. The contractor shall provide and install the exterior luminaires as noted in the luminaire schedule on the plans and located as indicated.
B. The exterior luminaires being provided for this project shall be submitted for approval with those on Section 265100.
C. The conduit/conductor installation shall comply with the specification relating to the respective section, but the conductor size shall be taken from the plans and shall comply therewith.
D. Any and all scratches to the pole shall be finished to match the factory finish.
E. When the installation is complete, the luminaire must be clean and the area free of debris.

END OF SECTION
SECTION 31 2200
GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Review existing site conditions.
   B. Rough grading the site for building pads, site or site structures.
   C. Fill and Compaction as required to prepare building pad areas.
   D. Finish grading.
   E. Landscaping is not included in this contract.

1.02 RELATED REQUIREMENTS
   A. Section 31 2316 - Excavation.
   B. Section 31 2323 - Fill: Filling and compaction.

1.03 SUBMITTALS
   A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.04 PROJECT CONDITIONS
   A. Protect below-grade utilities that remain.

PART 2 PRODUCTS

2.01 MATERIALS
   A. Structural Fill: Silt Soils excavated on-site. Free of lumps larger than 3 inches, rocks larger than 4 inches, and debris.
   B. Other Fill Materials: See Section 31 2323.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that survey bench mark and intended elevations for the Work are as indicated.
   B. Verify the absence of standing or ponding water.

3.02 PREPARATION
   A. Identify required lines, levels, contours, and datum.
   B. Stake and flag locations of known utilities.
   C. Locate, identify, and protect from damage above- and below-grade utilities to remain.
   D. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.
   E. Protect site features to remain, including but not limited to bench marks, survey control points, and curbs, from damage by grading equipment and vehicular traffic.
3.03 ROUGH GRADING
A. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded in areas not previously completed by the Owner.
B. Do not remove wet subsoil.
C. See Section 31 2323 for filling procedures.
D. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack surface water control.

3.04 SOIL REMOVAL
A. Stockpile soil to be re-used on site; remove remainder from site. Excess material removed from site shall be moved to designated area.
B. Stockpiles: Use areas designated on Site by ITD.

3.05 PREPARATION
A. Scarify subgrade surface to a depth of 6 inches to identify soft spots.
B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Granular Fill.
C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.06 FILLING
A. Fill to contours and elevations indicated using unfrozen materials.
B. Fill up to finish grade elevations unless otherwise indicated.
C. Employ a placement method that does not disturb or damage other work.
D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
E. Maintain optimum moisture content of fill materials to attain required compaction density.
F. Granular Fill: Place and compact materials in equal continuous layers not exceeding 12 inches compacted depth.
G. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.
H. Slope grade away from building pad locations minimum 2 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
I. Correct areas that are over-excavated.
   2. Load-bearing foundation surfaces: Use structural fill, flush to required elevation, compacted to 97 percent of maximum dry density.
   3. Other areas: Use general fill, flush to required elevation, compacted to minimum 95 percent of maximum dry density per ASTM.
J. Compaction Density Unless Otherwise Specified or Indicated:
   1. Under slabs-on-grade and similar construction: 97 percent of maximum dry density per ASTM.
   2. At other locations: 95 percent of maximum dry density.
K. Reshape and re-compact fills subjected to vehicular traffic.

3.07 FILL AT SPECIFIC LOCATIONS
A. Use general fill unless otherwise specified or indicated.
B. Structural Fill
   1. Use structural fill.
   2. Fill up to subgrade elevations.
   3. Maximum depth per lift: 12 inches, compacted.
   4. Compact to minimum 97 percent of maximum dry density.

3.08 FINISH GRADING
   A. Before Finish Grading:
      1. Verify building and trench backfilling have been inspected.
      2. Verify subgrade has been contoured and compacted.

3.09 TOLERANCES
   A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.
   B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).

3.10 FIELD QUALITY CONTROL
   A. See Section 31 2323 for compaction density testing.

3.11 CLEANING
   A. Leave site clean and raked.

END OF SECTION
SECTION 31 2316
EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Review existing site conditions.
   B. Excavating for footings and slabs-on-grade.

1.02 RELATED REQUIREMENTS
   A. Section 01 7000 - Execution and Closeout Requirements: General requirements for dewatering of excavations and water control.
   B. Section 31 2200 - Grading: Grading.
   D. Section 31 2323 - Fill: Fill materials, filling, and compacting.

1.03 PROJECT CONDITIONS
   A. Verify that survey bench mark and intended elevations for the Work are as indicated.
   B. Protect bench marks, survey control points, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that survey bench mark and intended elevations for the work are as indicated.

3.02 PREPARATION
   A. Identify required lines, levels, contours, and datum locations.
   B. See Section 31 2200 for additional requirements.
   C. Locate, identify, and protect utilities that remain and protect from damage.
   D. Notify utility company to remove and relocate utilities.
   E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
   F. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by the JHS Architects.

3.03 EXCAVATING
   A. Excavate to accommodate new structures and construction operations.
   B. Notify JHS Architects of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
   C. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.
   D. Do not interfere with 45 degree bearing splay of foundations.
E. Cut utility trenches wide enough to allow inspection of installed utilities.
F. Hand trim excavations. Remove loose matter.
G. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yard measured by volume. See Section 31 2316.26 for removal of larger material.
H. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 2323.
I. Provide temporary means and methods, as required, to remove all water from excavations until directed by the JHS Architects. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.
J. Remove excavated material that is unsuitable for re-use from site.
K. Stockpile excavated material to be re-used in area designated on site 31 2200.
L. Remove excess excavated material from site.

3.04 FIELD QUALITY CONTROL
A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.
B. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.

3.05 PROTECTION
A. Divert surface flow from rains or water discharges from the excavation.
B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.
D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
E. Keep excavations free of standing water and completely free of water during concrete placement.

END OF SECTION
SECTION 31 2323
FILL

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Review existing site conditions.
B. Filling, backfilling, and compacting for building volume below grade, footings, paving, and site structures.
C. Landscaping and sprinkling is not in this contract.

1.02 RELATED REQUIREMENTS
A. Section 31 2200 - Grading: Removal and handling of soil to be re-used.
B. Section 31 2200 - Grading: Site grading.
C. Section 31 2316 - Excavation: Removal and handling of soil to be re-used.

1.03 DEFINITIONS
A. Finish Grade Elevations: Indicated on drawings.
B. Subgrade Elevations: Indicated on drawings.

1.04 REFERENCE STANDARDS
C. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN·m/m³)); 2012.
E. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN·m/m³)); 2012.
G. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.
H. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010.

1.05 DEFINITIONS
A. Finish Grade Elevations: Indicated on drawings.
B. Subgrade Elevations: Indicated on drawings.

1.06 SUBMITTALS
A. See Section 01 3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.
C. Compaction Density Test Reports.
1.07 DELIVERY, STORAGE, AND HANDLING
   A. When necessary, store materials on site in advance of need.
   B. When fill materials need to be stored on site, coordinate location with ITD.
      1. Prevent contamination.
      2. Protect stockpiles from erosion and deterioration of materials.
   C. Verify that survey bench marks and intended elevations for the Work are as indicated.

PART 2 PRODUCTS

2.01 FILL MATERIALS
   A. General Fill - Fill Type silt soil: Subsoil excavated on-site.
      1. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
   B. Structural Fill - Fill Type silt soils: Subsoil excavated on-site.
      1. Graded and compacted with optimum moisture.
      2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
      3. Conforming to ASTM D2487 Group Symbol CL.
   C. Concrete for Fill: Lean concrete.
   E. Sand - Fill Type: Natural river or bank sand; free of silt, clay, loam, friable or soluble materials,
      and organic matter.
      1. Grade in accordance with ASTM D2487 Group Symbol SW.

2.02 SOURCE QUALITY CONTROL
   A. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis
      of soil material.
   B. Where fill materials are specified by reference to a specific standard, test and analyze samples
      for compliance before delivery to site.
   C. Where fill materials are specified by reference to a specific standard, testing of samples for
      compliance will be provided before delivery to site.
   D. If tests indicate materials do not meet specified requirements, change material and retest.
   E. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that survey bench marks and intended elevations for the Work are as indicated.
   B. Identify required lines, levels, contours, and datum locations.
   C. See Section 31 2200 for additional requirements.
   D. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.
   E. Verify structural ability of unsupported walls to support imposed loads by the fill.
   F. Verify underground tanks are anchored to their own foundations to avoid flotation after
      backfilling.
   G. Verify areas to be filled are not compromised with surface or ground water.
3.02 PREPARATION
A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.
B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with 6 inch minus Pit run.
C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING
A. Fill to contours and elevations indicated using unfrozen materials.
B. Employ a placement method that does not disturb or damage other work.
C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
D. Maintain optimum moisture content of fill materials to attain required compaction density.
E. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.
F. Soil Fill: Place and compact material in equal continuous layers not exceeding 12 inches compacted depth.
G. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise on the Site Grading Plan. Make gradual grade changes. Blend slope into level areas.
H. Correct areas that are over-excavated.
   1. Load-bearing foundation surfaces: Use structural fill, flush to required elevation, compacted to 100 percent of maximum dry density.
   2. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density per ASTM.
I. Compaction Density Unless Otherwise Specified or Indicated:
   1. Under slabs-on-grade and similar construction: 97 percent of maximum dry density per ASTM.
   2. At Parking Areas: 95 percent of maximum dry density.
   3. At other locations: 95 percent of maximum dry density.
J. Reshape and re-compact fills subjected to vehicular traffic.
K. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the JHS Architects. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.04 FILL AT SPECIFIC LOCATIONS
A. Use general fill unless otherwise specified or indicated.
B. Structural Fill at Building Pads:
   1. Use structural fill.
   2. Fill up to subgrade elevations.
   3. Maximum depth per lift: 12 inches, compacted.
   4. Compact to minimum 97 percent of maximum dry density.
C. Under Interior Slabs-On-Grade:
   1. Use granular fill - 6 inch minus Pit Run.
   2. Depth: 6 inches deep.
   3. Compact to 95 percent of maximum dry density.
   4. Cover with sand.
      a. Depth: 2 inches.
      b. Compact to 95 percent of maximum dry density.
D. At Foundation Walls and Footings:
   1. Use Structural Fill.
   2. Fill up to subgrade elevation.
   3. Compact each lift to 95 percent of maximum dry density.
   4. Do not backfill against unsupported foundation walls.
   5. Simultaneously on each side of unsupported foundation walls until supports are in place.

E. Over Subdrainage Piping at Foundation Perimeter and Under Slabs:
   1. Drainage fill and geotextile fabric: Section 33 4100.
   2. Cover drainage fill with general fill.
   3. Fill up to subgrade elevation.
   4. Compact to 95 percent of maximum dry density.

F. Over Buried Utility Piping, Conduits, and Duct Bank in Trenches:
   2. See applicable sections for bedding requirements.
   3. Cover with general fill.
   4. Fill up to subgrade elevation.
   5. Compact in maximum 8 inch lifts to 95 percent of maximum dry density in pipe zone and under any pavement areas. In other areas, such as landscaped areas, compact in 8 inch lifts to 92 percent.

3.05 TOLERANCES
   A. Top Surface of General Filling: Plus or minus 1.2 inch from required elevations.

3.06 FIELD QUALITY CONTROL
   A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.
   B. Perform compaction density testing on compacted fill in accordance with ASTM D1556.
   C. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor").
   D. If tests indicate work does not meet specified requirements, remove work, replace and retest.
   E. Proof roll compacted fill at surfaces that will be under slabs-on-grade.

3.07 CLEANING
   A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.
   B. Leave unused materials in a neat, compact stockpile.
   C. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
   D. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION
SECTION 32 1123
AGGREGATE BASE COURSES

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Aggregate base course.
   B. Paving aggregates.

1.02 RELATED REQUIREMENTS
   A. Section 31 2200 - Grading: Preparation of site for base course.
   B. Section 31 2323 - Fill: Topsoil fill at areas adjacent to aggregate base course.
   C. Section 31 2323 - Fill: Compacted fill under base course.
   D. Section 32 1216 - Asphalt Paving: Finish and binder asphalt courses.
   E. Section 32 1313 - Concrete Paving: Finish concrete surface course.

1.03 REFERENCE STANDARDS
   D. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.
   F. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.
   H. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.
   I. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.
   K. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010.

1.04 SUBMITTALS
   A. See Section 01 3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
   B. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
   C. Compaction Density Test Reports.
PART 2 PRODUCTS

2.01 MATERIALS
A. Coarse Aggregate Type: Coarse aggregate, conforming to State of Idaho Highway Department standard.
B. Coarse Aggregate: Natural washed stone; free of shale, clay, friable material and debris.
   1. Graded in accordance with ASTM C136/C136M, within the following limits:
      a. 2 inch sieve: 100 percent passing.
      b. 1 inch sieve: 95 percent passing.
      c. 3/4 inch sieve: 95 to 100 percent passing.
      d. 5/8 inch sieve: 75 to 100 percent passing.
      e. 3/8 inch sieve: 55 to 85 percent passing.
      f. No. 4 sieve: 35 to 60 percent passing.
      g. No. 16 sieve: 15 to 35 percent passing.
      h. No. 40: 10 to 25 percent passing.
      i. No. 200: 5 to 10 percent passing.
C. Fine Aggregate Type: Sand; conforming to State of Idaho Highway Department standard.
D. Fine Aggregate: Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter.
   1. Grade in accordance with ASTM D2487 Group Symbol SW.
E. Geotextile Fabric: Non-biodegradable, non-woven.

2.02 SOURCE QUALITY CONTROL
A. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis of aggregate materials.
B. Where aggregate materials are specified using ASTM D2487 classification, testing of samples for compliance will be provided before delivery to site.
C. If tests indicate materials do not meet specified requirements, change material and retest.
D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify that survey bench marks and intended elevations for the work are as indicated.
B. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.02 PREPARATION
A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
B. Do not place aggregate on soft, muddy, or frozen surfaces.

3.03 INSTALLATION
A. Spread aggregate over prepared substrate to a total compacted thickness of 10 inches.
   1. Course Base: 8"
   2. Fine Aggregate: 2"
B. Under Bituminous Concrete Paving:
   1. Place coarse aggregate to a total compacted thickness of 10 inches.
   2. Compact to 95 percent of maximum dry density.
C. Under Portland Cement Concrete Paving:
   1. Place coarse aggregate to a total compacted thickness of 6 inches.
   2. Compact to 95 percent of maximum dry density.
D. Place aggregate in maximum 4 inch layers and roller compact to specified density.
E. Level and contour surfaces to elevations and gradients indicated.
F. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
G. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
H. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.04 TOLERANCES
A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.
B. Scheduled Compacted Thickness: Within 1/4 inch.
C. Variation From Design Elevation: Within 1/2 inch.

3.05 FIELD QUALITY CONTROL
A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.
B. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D1556, ASTM D2167, or ASTM D6938.
C. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with AASHTO T 180, ASTM D698 ("standard Proctor"), or ASTM D1557 ("modified Proctor").
D. If tests indicate work does not meet specified requirements, remove work, replace and retest.
E. Proof roll compacted aggregate at surfaces that will be under slabs-on-grade.

3.06 CLEANING
A. Leave unused materials in a neat, compact stockpile.
B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION
SECTION 33 1200
WATER UTILITY PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Water Service to the building.

1.02 RELATED REQUIREMENTS
A. Section 22 1005 - Plumbing Piping:

1.03 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Test Reports: Indicate results comparative to specified requirements.

PART 2 PRODUCTS

2.01 WATER SERVICE
A. Refer to Plumbing drawings to coordinate routing of main service.
B. Preform water service piping per IBC Plumbing Code and local code requirements.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify that piping system has been cleaned, inspected, and pressure tested.

3.02 FIELD QUALITY CONTROL
A. Perform field inspection and testing in accordance with Section 01 4000.
B. Test samples in accordance with AWWA C651.

END OF SECTION