SEAUX-PIERCE
architecture

PROJECT MANUAL

Burnet City Hall

301 East Jackson Street
Burnet, Texas 78611

Project No. 2021-16
September 15th, 2023

SET

1014 Sailmaster Drive - Lakeway, Texas 78734
(512)419.930
www.seauxpierce.com

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ADVERTISEMENT FOR COMPETITIVE SEALED BIDS
RFP 2023-012

Sealed competitive bids, in envelopes addressed to the City of Burnet, 1001 Buchanan Drive Suite 4, Burnet, Texas 78611, for the **Burnet City Hall Project, PID: CIPSP-2022B,** in the City of Burnet, Texas, will be received at the above-mentioned address until 11:00 A.M., November 16, 2023, and then publicly opened and read aloud. Bids will be opened in-person and results made available via CIVCAST.

Submittals will be submitted in sealed envelopes and marked "Burnet City Hall Competitive Sealed Bid."

The Contract Documents and Specifications are available at the City of Burnet. Questions and requests for additional information shall be sent via CIVCAST. For this project, all bidders will be **required** to accept Addenda and other pertinent information by email, as well as provide written acknowledgement of Addenda as prescribed in the Instructions to Bidders. **No questions or requests for additional information will be accepted later than 5:00 p.m., November 9, 2023.**

Bid packages will be available on CivCast under ID: CIPSP-2022B, and at the City of Burnet City Hall, located at 1001 Buchanan Drive Suite 4, Burnet, Texas 78611, Monday through Friday, 8:00 a.m. to 5:00 p.m. for viewing only. Project general conditions and standard specifications manual can be found on the City's website at www.cityofburnet.com

An optional pre-bid conference will be held at the address above, on October 26, 2023, at 11:00 AM, and shortly thereafter visit the project site. More details will be made available on the web via CivCast.

A bid security of 5% of the bid amount must accompany each bid or proposal. A certified check or bank draft payable to the City of Burnet may be submitted in lieu of the Bid Bond. Any bonds submitted shall be issued from a surety actively doing business in the State of Texas.

After contract is awarded, the contractor will be required to furnish insurance, performance, and payment bonds.

The City of reserves the right to waive any informality that is not detrimental to any other bidder or potential bidder or to reject all bids or to accept the lowest responsible bidder that in the judgment of the City Council will be in the best interest of the City.

No bidder may withdraw his bid within sixty (60) days after the actual date of opening thereof.

City of Burnet, Texas
Eric Belaj, City Engineer

Newspaper ad published twice:

Wednesday September 27th, 2023
Wednesday October 4th, 2023

CITY HAS COPY OF AFFIDAVIT OF PUBLICATION.

If you have any questions, please e-mail Eric Belaj at: ebelaj@cityofburnet.com.

PROPOSAL INSTRUCTIONS

Project supplements to general conditions and standard specifications manual can be found on the City's website at www.cityofburnet.com.

1. PROJECT

Objective of Request for Competitive Sealed Bids process is to competitively procure services with a qualified contractor whose Proposal provides best value for Owner for the project description below:

Burnet City Hall Project, PID: CIPSP-2022B, in the City of Burnet, Texas
Base Bid: The Work (or project) is a Lump Sum Contract construction of a new approximately 16,709 SF City Hall building to include: parking (including South Parking), utilities, landscaping, water fountain, drainage, earthwork, building including foundation and all associated appurtenances for a fully functional building as shown in the design documents. The project entails 543 SF of covered porches, ADA ramps, plaza and elevated sidewalks, generator and associated components, communication and gas lines, and others not specifically noted herein. The project also includes coordination with various utilities, coordination with Architect, Engineer, and City Staff, creating and preparing samples for finishes, performing and Value Engineering if requested by the City involving certain trades or items.
The City would prefer hiring of qualified local subcontractors for various trades.
Contractor shall assure to install all associated appurtenances that are not specifically shown in the design for any complete component required for implementation of the design.

- *Water and Wastewater: The City shall separately install water and wastewater tap (including meter) up to the property line. The Contractor shall be responsible for such utility extensions (including the backflow preventer) within the property.*
- *Electric: The contractor shall be responsible for all components except the wiring, transformer (contractor to install pad), and meter itself.*

Added Bid Alt1: The base bid includes this Added Alternate which is the Removal of South parking lot. The limits of south parking lot are shown in clouded area. The alternate shall be removal of pavement, curbs, base, and adjacent sidewalk within this clouded area. The contractor shall assume that grading up to the subgrade limits of this design shall be installed.

2. PROPOSAL EVALUATION

Proposals will be received, publicly opened, and names and monetary Proposals of each Offeror read aloud. Subsequently, Proposals will be ranked according to criteria described in this Document. Both cost and non-cost factors will be evaluated according to section 2269 and 2269.151 of the local government code. Owner may enter into contract negotiations with highest ranked firm for completion of Work. If negotiations with highest ranked firm are unsuccessful, Owner will formally close negotiations with this firm and initiate contract negotiations with next highest ranked firm. The Owner shall not be responsible for any costs incurred by the Contractor (or firm) prior to contract execution. Upon agreement between both parties, a Contractor executed Contract may be recommended for approval by Owner's governing body. Upon approval, Contract will be executed by Owner.

Complete sets of Bid Documents must be used in preparing Proposals; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from use of incomplete sets of Bid Documents. Dates, locations, and times of the proposal submittal are outlined in the Advertisement for Proposal.

Owner and Engineer, in making copies of Bid Documents available on above noted terms, do so only for purpose of obtaining Proposals for Work and do not confer a license or grant for any other use.

3. SELECTION CRITERIA

Owner will consider several factors in selecting a winning bidder as noted in the section 2269 of the of State of Texas Government Code, and other applicable state codes which allow and will provide best value to Owner. The Owner is the City of Burnet, specifically the City Council. The City Council has delegated authority of review to a sub-committee comprised of Council Members and City Staff. Bids will be evaluated using the following criteria and weighting:

1. Proposed Project Cost: Offeror's Proposed Cost of Performing Work shall be indicated in the Bid or Proposal Form.
2. The reputation of the bidder and of the bidder's goods or services: Provide general information about Organization and a Statement of Qualifications. Include information on Projects on similar which Offeror has had significant involvement in the last five (5) years, or that demonstrate experience with similar Projects. This list is to include name and a current telephone number of references for each of these Project assignments. Offerors are to include a list of current Project assignments for each of individuals proposed, anticipated completion date for this assignment and percentage of time they will have available to devote to this Project.
3. Experience/Qualifications of Sub-Contractor(s): Provide information on Sub-Contractor(s) who are to complete 25% of more of the project in terms of cost, qualifications including information on Projects of similar which Sub-Contractor(s) has been in charge of in the last five (5) years, or that demonstrate experience with similar Projects. This list is to include name and a current telephone number of references for each of these assignments. Subcontractor shall name a Superintendent who must be dedicated to this Project full time for duration of Project and may not be changed without written approval by Engineer. In the event that Contractor does not intend to outsource any work over 25%, then the evaluations criteria for the Contractor or Contractor's project team will be utilized to complete this portion of the evaluation.
4. Other Factors: Owner will consider other factors in evaluating Bids, including but not limited to the following:
    a. The bidder's past relationship with the municipality.
    b. Any relevant criteria specifically listed in the request for bids as noted herein.
    c. Ability to Meet Proposed Time for Construction: Provide information to demonstrate ability of Organization to complete Projects within budget and on time.
    d. Quality of Work: Demonstrated quality of Work on completed Projects as determined by site visits or discussions with references for Projects. Quality considerations may include appearance of completed Work, amount of warranty or rework required, durability and maintainability of completed Project, and quality of documentation provided.
    e. Safety: Demonstrated success in implementation of a site safety program.
    f. Claims Experience and Litigation History: Provide a list all claims or litigation involving construction Projects that have been filed by Offeror or Owner within last five (5) years, or that are currently outstanding.
    g. Other factors submitted such as Financial Standing, Superintendent Experience, proposals for changes to reduce cost, or any other factors the Contractor submits for consideration.
    h. For projects over $1.5MM the municipality may attempt to award project to lowest responsible bidder.

The criteria and weighting for the ranking of Offeror's Proposals is as outlined Below:

Item No.	Evaluation Criteria	Points
1.	Project Cost	40
2.	Contractor Experience	20
3.	Sub-Contractor Experience	20
4.	Other Factors	20
	TOTAL	100

In order to determine the Contractors ability to perform the work, the Owner may consider the qualifications and experience of Subcontractors, Suppliers, and other persons and organizations proposed for those portions of Work as to which identity of Subcontractors, Suppliers, and other persons and organizations must be submitted as provided in General Conditions. Owner may also consider the operating costs, maintenance requirements, performance data and guarantees of major items of materials and equipment proposed for incorporation in Work when such data is required to be submitted prior to recommendation of award.

Owner may consider qualifications (Statement of Qualifications) of Offerors and Offeror's subcontractors and consultants, in addition to proposed cost(s) (Proposal Form) when evaluating Proposals to determine which Proposal offers best value to Owner. Owner will rank each of Offeror's Proposals based on criteria and criteria weighting described herein.

Evaluation and ranking of Proposals will be completed no later than 7th calendar day from date of Proposal opening and Selection no later than the 45th day of the Proposal opening. Offerors are requested not to withdraw their Proposals within 60 calendar days from date on which Proposals are opened. If a submitted BID is withdrawn within the said period, BID guarantee shall become property of the OWNER, not as penalty, but as liquidated damages, and OWNER may pursue other action allowed by law. Regardless of the aforementioned 60-day timeline, Proposal Security of highest-ranking firms will be held by Owner until contract negotiations are finalized. The successful BIDDER (after contract is awarded) must furnish a "PERFORMANCE BOND" and "PAYMENT BOND" on forms provided with the Contract Documents. Each bond shall be issued in an amount of one hundred percent (100%) of the Contract amount from a solvent Surety company, authorized to do business in the State of Texas and acceptable to the OWNER. Prior to acceptance and retainage issuance, the Contractor shall issue the city a 10% one Year maintenance Bond and a lien release, form for which shall be supplied by the City.

4. OTHER PROCEDURES

Owner may conduct such investigations as Owner deems necessary to assist in evaluation of any Proposal and to establish the responsibility, qualifications and financial ability of Offerors, proposed Subcontractors, Suppliers and other persons and organizations to perform and furnish Work in accordance with Contract Documents to Owner's satisfaction within prescribed time.

Owner, at its discretion, may also choose to conduct interviews with to ranking Offerors to provide offerors a better opportunity to demonstrate they can provide best value to Owner for this Project. After bid opening, City staff, or representing committee, will contact the bidder appearing to offer best value for the City, and discuss any possible changes proposed. City staff, or representing committee, will then make recommendation to council for approval.
Failure to participate in the interview may result in disqualification from consideration for project. Should Owner choose to conduct interviews with top ranking Offerors, they will be notified of:

1. Time and place for interview.
2. Interview format and agenda.
3. Individuals that are expected to participate in the interview.

Owner reserves right to adopt most advantageous interpretation of Proposals submitted in case of ambiguity or lack of clearness in stating Proposal Prices, to reject any or all Proposals, and/or waive informalities.

5. REPRESENTATIONS

ARTICLE 1 - DEFINITIONS

1.1 Bidding Documents include the Advertisement or Invitation to Bid, Instructions to Bidders, addenda, the Bid Forms, Qualification Statement, Bid Form, and documents as listed in the index. The Contract Documents proposed for the Work consist of the Bidding Documents, the Owner-Contractor Agreement, the Conditions of the Contract (General,

Supplementary, and other Conditions), the Drawings, the Specifications and all Addenda issued prior to, and all Modifications issued after, execution of the Contract.

1.2 All definitions set forth in the General Conditions of the Contract for Construction, AIA Documents A101-2017 and A201-2017, or in the 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 signed proposal to do the Work or designated portion thereof 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 applicable Base 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 or services as described in the Bidding Documents or in the proposed Contract Documents.

1.8 A Bidder is a person or entity who submits a Bid.

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

ARTICLE 2 - BIDDER'S REPRESENTATIONS

2.1 Each Bidder by making his Bid represents that:

A. The bidder has read and understands the Bidding Documents and his Bid is made in accordance therewith.

B. The Bidder has visited the site, has familiarized himself with the local conditions under which the Work is to be preformed, and has correlated his observations with the requirements of the proposed Contract Documents.

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

D. The Bid is not based on any verbal instructions contrary to the Contract Documents as advertised and as modified by Addenda.

2.2 The Bidder must be fully qualified under any state or local licensing law for Contractors in effect at the time and at the location of the Work before submitting his Bid. The Contractor shall be responsible for determining that all of his Sub-bidders or prospective Sub-Contractors are duly licensed in accordance with the law.

ARTICLE 3 - BIDDING DOCUMENTS

3.1 Copies:

A. Bidding Documents may be examined through the City's Website and common bid website as noted in Advertisement for Bids. Bid documents will be made available for download through these two venues for free, and via a fee option below.

B. Bidding Documents may be obtained by prospective BIDDERs or suppliers at the Engineer's or Architect's office upon the non-refundable payment (Fee is determined by the consultant engineering/architecture firm). of the sum of $50.00 for each set of documents.

B. Bidders shall use COMPLETE sets of Bidding Documents in preparing Bids; neither the Owner nor the Architect assume any responsibility for errors or misinterpretations resulting from use of incomplete sets of Bidding Documents.

C. The Owner or the Architect in making copies of the Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids on the Work and do not confer a license or grant for any other use.

3.2 Interpretation or Correction of Bidding Documents:

A. Bidders and Sub-bidders shall promptly notify the Owner or Design Professional of any ambiguity, inconsistency, or error which they may discover upon examination of the Bidding Documents or of the site and local conditions.

B. Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request which shall reach the Owner or Design Professional at least seven (7) days prior to the date for receipt of Bids. The person submitting the request shall be responsible for its prompt delivery.

C. Any interpretation, correction, or change of the Bidding Documents will be made by Addendum. Interpretations, corrections, or changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon such interpretations, corrections, and changes.

3.3 Substitutions:

A. 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 substitutions; the products described do not restrict Bidders to the specific brand, make, manufacturer, or specification named unless specifically stated that no substitution will be allowed; otherwise equivalent products (in Architect's/Engineer's opinion) will be acceptable.

B. No substitution will be considered prior to receipt of Bids unless an original written request for approval has been received by the Architect at least seven days prior to the date for receipt of Bids. **Facsimile transmission of requests shall not be considered an original submission and shall not be considered.** Each such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute including model numbers, drawings, cuts, performance and test data, and any other information necessary for an evaluation. A statement setting forth any changes in other materials, equipment, or other Work that incorporation of the substitute would require shall be included. The burden of proof of the merit of the proposed

substitute is upon the proposer. The Owner's or Design Professional's decision of approval or disapproval on a proposed substitution shall be final.

C. If the Architect approves any 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.

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

3.4 Addenda:

A. Addenda will be mailed or delivered to all who are known by the Architect to have received a complete set of Bidding Documents.

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

C. No Addenda will be issued within a period later than seventy-two (72) hours prior to the advertised time for receipt of Bids, excluding Saturdays, Sundays, and any other legal holidays; however, if the necessity arises to issue an addendum modifying plans and specifications within the seventy-two hour (72) period prior to the advertised time for the opening of bids, then the opening of bids shall be extended exactly one week, without the requirement of re-advertising.

D. Each Bidder shall ascertain, prior to submitting his Bid, that he has received all Addenda issued, and he shall acknowledge their receipt on his Bid Form.

ARTICLE 4 - BIDDING PROCEDURE

4.1 Form and Style of Bids:

A. All blanks on the Bid Form shall be filled in by typewriter or manually in ink. If requested on the Bid Form, Bidders shall take special note of the requirement to indicate certain material or equipment suppliers and/or subcontractors on the Bid Form. Failure to provide the information requested may be sufficient cause for rejection of Bid.

B. Where so indicated by the makeup of the Bid Form, sums shall be expressed in both words and figures, and in case of discrepancy between the two, the amount written in words shall govern.

C. Any interlineations, alteration, or erasure must be initialed by the signer of the Bid or his authorized representative.

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

E. Each copy of the Bid shall include the legal name of the Bidder and a statement that the Bidder is a sole proprietor, a partnership, a corporation, or some other legal entity. 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.

F. Qualifications or exceptions attached to the Bid Form, or submitted within the sealed envelope containing the Proposal, or submitted within or attached to the sealed envelope containing the Proposal, are not acceptable and is sufficient cause for rejection of the Bid.

4.2 Submission of Bids:

A. 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.

B. Bids shall be deposited at the designated location prior to the time and date for receipt of Bids indicated in the Advertisement or Invitation to Bid, or any extension thereof made by Addendum. Bids received after the time and date for receipt of Bids will be held for 30-days in which time the bidder may send the City a paid for postage and a return address, or pick document up in person.

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

D. Oral, telephonic, or telegraphic Bids are invalid and will not receive consideration.

4.4 Modification or Withdrawal of Bid:

A. 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.

B. Prior to the time and date designated for receipt of Bids, any 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.

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

D. Bid Security, if any is required, shall be in an amount sufficient for the Bid as modified or resubmitted.

ARTICLE 5 - OTHER PROCEDURES

1. Rejection of Bids: The Owner shall have the right to reject any or all Bids and in particular to reject a Bid not accompanied by any required Bid Security or by other data required by the Bidding Documents, or to reject a Bid which is in any way incomplete, irregular, or contains qualifications of any kind.

2. The Owner shall have the right to waive any informality or irregularity in any Bid or Bids received and to accept the bid or Bids which, in his judgment, is in his own best interest.

3. Alternates, if accepted, shall be accepted in the order in which they are listed on the Bid Form. Determination of the low Bidder shall be on the basis of the sum of the Base Bid and any Alternates accepted. However, the Owner shall reserve the right to accept Alternates in any order which does not affect determination of the low Bidder.

4. After award, the Contractor shall have 14 calendar days to submit a signed contract and required bonds and insurance, along with all City requested forms.

ACKNOWLEDGMENT OF ADDENDA

Acknowledgement of Addenda:

All Addenda must be acknowledged below in the space provided. Alternatively, Addenda may be acknowledged on the outside of the sealed envelope submitted for bid next to the project name. Inclusion of the full text of any Addendum in this bid packet will also constitute the bidder's acknowledgement of that Addendum.

Bidder's Name: _____

(Fill in Bidder's Name exactly as it appears on pages 2 and 3 of the Bid Form)

I have received, acknowledge, and accept all of the following Addenda:

ADDENDUM NO.	SIGNATURE

Failure to acknowledge all addenda issues may result in a forfeited bid. Owner reserves right to adopt most advantageous interpretation of Proposals submitted in case of ambiguity or lack of clearness in stating Proposal, to reject any or all Proposals, and/or waive informalities.

BID FORM

PROJECT IDENTIFICATION: Burnet City Hall

PROJECT IDENTIFICATION NUMBER (PID): CIPSP-2022B

THIS BID IS SUBMITIED TO: Ms. Kelly Dix, City Secretary, City of Burnet, Texas

1. The undersigned BIDDER proposes and agrees, if this Bid is accepted, to enter into an Agreement with OWNER in the form included in the Contract Documents to perform and furnish all Work as specified or indicated in the Contract Documents for the Bid Price and within the Bid Times indicated in this Bid and in accordance with the other terms and conditions of the Contract Documents.

2. BIDDER accepts all of the terms and conditions of the Advertisement of Invitation to Bid and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for thirty-five days offer the day of Bid opening. BIDDER will sign and deliver the required number of counterparts of the Agreement with the Bonds and other documents required by the Bidding Requirements within fifteen days after the date of OWNER'S Notice of Award.

3. In submitting this bid, BIDDER represents, as more fully set forth in the Agreement, that:

   (a) BIDDER has examined and carefully studied the Bidding Documents; including (but not limited to) the following:

   BID PACKET – *All portions of the Contractor's Bid Packet including the Instructions to Bidders, General Conditions, and any Special and /or Supplementary Conditions*

   DRAWINGS – *Most current set of drawings*

   SPECIFICATIONS – *Most current City of Burnet Technical Construction Standards, Specifications Manual, and any other as stated in the construction drawings.*

   ADDENDA - *Acknowledged on the Bid Summary Sheet or on the sealed bid envelope*

   (b) BIDDER has visited the site and become familiar with and is satisfied as to the general, local and site conditions that may affect cost. progress, performance and furnishing of the Work;

   (c) BIDDER is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress, performance and furnishing of the Work.

   (d) BIDDER has carefully studied all reports of explorations and tests of subsurface conditions at or contiguous to the site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in the General Conditions. BIDDER accepts the determination set forth in the Supplementary Conditions of the extent of the "technical data" contained in such reports and drawings upon which BIDDER is entitled to rely as provided in the General Conditions. BIDDER acknowledges that such reports and drawings are not Contract Documents and may not be complete for BIDDER'S purposes. BIDDER acknowledges that OWNER and ENGINEER do not assume responsibility for the accuracy or completeness of information and data shown or indicated in the Bidding Documents with respect to Underground Facilities at or contiguous to the site. BIDDER has obtained and carefully studied (or assumes responsibility for having done so) all such additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the site or otherwise which may affect cost. progress, performance or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences and procedures of construction to be employed by BIDDER and safety precautions and programs incident thereof. BIDDER does not consider that any additional examinations, investigations, explorations, tests, studies or data are necessary for the determination of this Bid for performance and furnishing of the Work in accordance with the limes, price and other terms and conditions of the Contract Documents.

   (e) BIDDER is aware of the general nature of Work to be performed by OWNER and others at the site that relates to Work for which this Bid is submitted as indicated in the Contract Documents.

   (f) BIDDER has correlated the information known to BIDDER, information and observations obtained from visits to the site, reports and drawing identified in the Contract Documents and all additional examinations, investigations, explorations, tests, studies and data with the Contract Documents.

   (g) BIDDER has given ENGINEER written notice of all conflicts, errors, ambiguities or discrepancies that BIDDER has discovered in the Contract Documents and the written resolution thereof by ENGINEER is acceptable to BIDDER, and the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for

performing and furnishing the Work for which this Bid is submitted.

(h) This Bid is genuine and not made in the interest of or on behalf of any undisclosed person, firm or corporation and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; BIDDER has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; BIDDER has not solicited or induced any person, firm or corporation to refrain from bidding; and BIDDER has not sought by collusion to obtain for itself any advantage over any other Bidder or over OWNER.

4. Contractor shall be required to submit a unit price schedule for approval by the Owner. Measurement shall be based solely on Plan Quantities as listed in the Unit Price Schedule; no quantities shall be measured in the field for payment purposes. BIDDER will complete the Work in accordance with the Contract Documents for the Unit Prices and Quantities listed on the Unit Price Schedule for the total bid in numbers as entered on the Bid Summary Sheet.

5. BIDDER agrees that the Work will be substantially complete, and completed and ready for final payment in accordance with the lines specified in the Conditions of the Agreement. BIDDER accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the lines specified in the Agreement.

6. The following documents are required to be attached to be made a condition of this Bid:
(a) Required Bid Security in the form of certified check, cashier's check or corporate surety bond.
7. Communications concerning this Bid shall be addressed to:

Civil Engineering Projects:
Mr. Eric Belaj, PE, CFM
City Engineer
City of Burnet
1001 Buchanan Drive Suite 4
Burnet, Texas 78611
(512) 756-609
ebelaj@CityofBurnet.com

Building Projects to the Architect:
Chad Pierce
Seaux-Pierce Architects
1014 Sailmaster Street
Austin TX, 78734
(512) 419-9301 x 1
chad@seauxpierce.com

Note that if the bid is submitted on CivCast or other bid room, all correspondence shall occur through that venue.

The address of BIDDER indicated below:

8. Terms used in this Bid which are defined in the General Conditions or Instructions will have the meanings indicated in the General Conditions or Instructions.

9. SUBMITTED on _____, 20_____.

Contractor License No. _____

Construction Description: Provide a proposal along with the items laid out in the Scope of Work attached hereto.
We, the undersigned, propose to furnish all materials, labor, and equipment for the completion of this project and guarantee that if we are awarded the bid, we will furnish the goods in accordance with the attached specification. THIS FORM MAY BE COPIED

TOTAL LUMP SUM PROPOSAL PRICE: $ _____ in US Dollars.

The Base Bid of the undersigned bidder based upon the quantities shown and the unit prices bid

Spell-Out):_____

_____Dollars, and _____ Cents.

Alternate No. 1: DEDUCTION PROPOSAL PRICE: $ _____ in US Dollars.

By submitting this proposal, the submitter understands that they must enter into an agreement with the City for the award of this contract. The City may enter into a contract that restricts the total contract amount, total contract time, or number of accounts served.

BID PRICE IS GUARANTEED FOR 90 (NINETY) DAYS AFTER BID OPENING BY CITY.

The City of BURNET shall have the right to take such steps as it deems necessary to determine the ability of the bidder, to perform his obligations under the Contract and the bidder shall furnish the City of BURNET all such information and data for this purpose, as the City of BURNET may request it. The right is reserved to reject any bid where an investigation of the available evidence or information does not satisfy the City of Burnet, whereas the bidder is qualified to carry out properly the terms of the contract.

We, the undersigned, propose to furnish the item listed below and guarantee that if we are awarded the bid, we will furnish the goods in accordance with the attached documents and the City's Technical Construction Standard Manual and Other Specifications and Conditions in the bid and contract documents. Bidders will be required to fill out State of Texas Conflict of Interest Questionnaire and form TGC 2270 and no boycott forms.

If BIDDER is:

An Individual

By _____(SEAL)
(Individual's Name)

doing business as_____

Business address:_____

_____

Phone No.: _____

Email Address: _____

A Partnership

By _____(SEAL)
(Firm Name)

_____
(General Partner)

Business address:_____

_____

Phone No.:_____

Email Address:_____

A Corporation

By _____(SEAL)
(Corporation Name)

_____
(State of Incorporation)

By _____(SEAL)
(name of person authorized to sign)

_____
(Corporate Seal) *(Title)*

Attest _____
(Secretary)

Business address:_____

_____

Phone No.:_____

Email Address:_____

Date of Qualification to do business is_____

A Joint Venture

By _____(SEAL)
(Name)

_____
(Address)

By _____(SEAL)
(Name)

_____
(Address)

Phone No.: _____

Email Address:_____

(Each joint venturer must sign. The manner of signing for each individual, partnership and corporation that is a party to the joint venture should be in the manner indicated above).

PROPOSED CONSTRUCTION DURATION

The Base Bid of the undersigned bidder based upon the quantities shown and prices bid shown on the bid form proposes to complete the project, including all labor and material for the duration which includes all holidays and non standard works days, per calendar days as noted:

All work in this bid will be substantially completed within _____ calendar days after the issuance of the notice to proceed.

All work bid will be totally completed within 30 calendar days after the substantial acceptance by the OWNER.

BIDDER: _____

SIGNED BY:_____

NAME PTINTED: _____

TITLE: _____

BID BOND

KNOW ALL BY THESE PRESENTS: that the undersigned Principal and Surety are firmly bound to the City of Burnet ("City") in the penal sum of:_____ _____Dollars ($_____).

Now the condition of this bond is this: that, whereas the undersigned principal has submitted to the City a bid to enter into a certain contract whereupon principal undertakes to perform the following-described work of construction, alteration or repair:

Project Title: _____

NOW, THEREFORE, if the principal shall, within 30 days following acceptance by the City Council of the City of Burnet of such bid and award by said Council to said principal of said contract, execute and return such further contract documents, together with such bonds and insurance documents as may be required by the terms of the bids accepted, then this obligation shall be null and void, otherwise it shall remain in full force and the amount hereof shall be paid to and retained by the City as liquidated damages for principal's failure to do so.

IN WITNESS WHEREOF, the above bound parties have executed this instrument under their several seals this the ___ day of _____, 20__, the name and corporate seal of each corporate party being hereto affixed and by these presents duly signed by its undersigned representative, pursuant to the authority of its governing body.

Principal: _____

By: _____

Title: _____ Date: _____

Surety: _____

By: _____

Title: _____ Date: _____

(*Attach Power of Attorney*)

Bidder Qualification Form - Construction

(Firm must prepare this statement in the form shown)

The undersigned bidder certifies that the information herein is true, correct, complete and accurate. Elaboration on the following information or additional information deemed to be useful for evaluation of bidder's capabilities or to prevent misleading representations may be attached to this form. With exception to material and equipment suppliers, any subcontractor completing 25% or more of the project in terms of cost, is required to fill out this form.

Date: _____ Texas License Number: _____ Federal ID No.: _____

Bidder (Legal Name of Firm): _____

Address: _____ Phone Number: _____

_____ Fax Number: _____

City: _____ State: ____ Zip Code: _____ Email: _____

President (or Managing Partner, etc.): _____

Dun and Bradstreet Number (if any): _____

Years in Business Under Present Name: _____

List all other names under which your business has operated in the last 10 years:

_____

Work Presently Under Contract ($): _____

Work in place last year ($): _____

Total Bonding Capacity ($): _____
(Attach a letter from Bonding Co. evidencing bonding capacity)

Value of Work Presently Bonded ($): _____

Bonding Company: _____

Bonding Agent: _____

Insurance Company: _____

Insurance Agent: _____ Phone: _____

Total Staff Employed by Firm *(Break down by Managers and Trades on separate sheet)*: _____

Contracting Specialty *(Indicate trades in which bidder performs)*: _____

Union Affiliations: ☐ Local ☐ National

Years Performing Work Specialty:_____ Percentage of Work Performed by Firm's Own Forces:_____

Is the Bidder in compliance with all applicable EEO requirements? ☐ Yes ☐ No
(If the answer is no, please attach summary of details on a separate sheet)

Bank References

Address: _____ Contact Name:_____

City: _____ State:_____ Zip Code:_____ Phone Number: _____

Has the firm or predecessor firm been involved in a bankruptcy or reorganization? ☐ Yes ☐ No
(If the answer is yes, please attach summary of details on a separate sheet)

Relevant Experience

Bidder should have successfully completed (substantially on-schedule, on-budget) at least three projects of similar size and nature for which they are submitting qualifications. List projects on a separate sheet with the following information on each and attach hereto:

1. Experience:

Project *(Name, Location and Contact)*
Architect *(N/A if not applicable):*
Engineer:
Contract Amount: $
Date Completed *(Month/Year)*
Scope of Work:_____
List below any/all Contract(s) awarded to Bidder which it has failed to complete *(If applicable, attach a separate sheet)*:

Project *(Name and Location)*:_____
Contract with:_____
Brief Explanation of Cause and Resolution:_____

_____

2. The reputation of the bidder and of the bidder's goods or services:

Provide general information about Organization and a Statement of Qualifications. Include information on Projects on similar which Offeror has had significant involvement in the last five (5) years, or that demonstrate experience with similar Projects.

_____
_____
_____

3. Experience/Qualifications of Sub-Contractor(s):

Provide information on Sub-Contractor(s) who are to complete 25% of more of the project in terms of cost, qualifications including information on Projects of similar which Sub-Contractor(s) has been in charge of in the last five (5) years, or that demonstrate experience with similar Projects.

_____
_____
_____

4. Other Factors:
Owner will consider other factors in evaluating Bids, including but not limited to the items indicated in the proposal instructions.

_____
_____
_____

Has your company or company's principal(s), under contract as a prime contractor or sub-contractor, performed work with the city?

☐ yes ☐ no

Please Describe if yes: _____

If your company or company's principal(s) have performed work for the city as a prime contractor or sub-contractor, were any of those prior contracts subject to liquidated damages?

☐ yes ☐ no

Please Describe if yes: _____

List on a sheet attached hereto all judgments, claims, arbitration proceedings, or suits pending or outstanding against bidder over the last five (5) years with amount of claim and brief description.

List on a sheet attached hereto all lawsuits or requested arbitration with regard to construction contracts which bidder has initiated within the last five (5) years and brief explanation of claim and outcome.

Attach to this form Bidder's current Financial Statement (assets/Liabilities), preferably audited.
A bid may be disqualified if the company or company's principal(s) have prior work experience with the city, as a prime consultant or sub-consultant, and the contract for that work was subject to liquidated damages. After the public bid opening, if a bidder does not respond to information requests regarding their statement of qualifications within 3 business days, the bid may be disqualified.

Signature:_____

Name (Officer or Partner):_____

Title:_____

Date:_____

AFFIDAVIT OF AUTHENTICITY

Must be included with Bidder's Qualifications

STATE OF TEXAS :

COUNTY OF :

ON THIS, the _____ day of _____, _____, before me, a Notary Public, the undersigned officer, personally appeared _____, who acknowledged her/himself to be the _____ of _____
[title] *[Contractor's full name]*
being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing the name of the said contractor by her/himself as such _____, executed the foregoing instrument for the purposes therein contained by signing her/his name.
[title]

STATE OF TEXAS :

COUNTY OF :

Sworn to and subscribed before me on the_____ day of _____, _____ (year), by _____.
(name of signer)

_____
Notary Public's Signature

Certification of No Boycott

No Boycott Israel

If Contractor/Vendor is a "Company", as that term is defined in Section 808.001 of the Texas Government Code and is not a sole proprietorship, then Contractor/Vendor certifies and verifies that it: (i) does not boycott Israel and (ii) will not boycott Israel during the term of the Purchase Order or Contract this Certification is attached to and incorporated into; or (iii) that it meets the requirements of an exception listed below.

Form requirements:

- **This certification is required by Texas Government Code § 2271.002.**
- This form is required to be attached to and is incorporated into all Purchase Orders (goods) and Contracts (services) with a value of $100,000 or more that is paid in whole or in part with state funds with a company with 10 or more full time employees. The campus department making the purchase of goods or contracting for services is responsible for obtaining the form from the Vendor or Contractor.

Texas Government Code §808.001 states that "Boycott Israel" means "refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations specifically with Israel, or with a person or entity doing business in Israel or in an Israeli-controlled territory, but does not include an action made for ordinary business purposes". Furthermore, Texas Government Code §808.001 states that the term"Company" means a "for-profit sole proprietorship, organization, association, corporation, partnership, joint venture, limited partnership, limited liability partnership, or limited liability company, including a wholly owned subsidiary, majority-owned subsidiary, parent company, or affiliate of those entities or business associations that exists to make a profit", provided however that Texas Government Code §2271.001(2) excludes sole proprietorships from this definition of "Company".

Vendor/Contractor Name or Company Name	
Street Address	
City	
State	
Zip Code	
Phone Number	
Printed Name of Authorized Representative	
Title of Authorized Representative	
Signature of Authorized Representative	
Date	

ONLY COMPLETE THIS SECTION IF YOU BELIEVE YOU ARE NOT REQUIRED TO PROVIDE THE CERTIFICATION - No Boycott Israel - FOR THE REASONS CITED BELOW

My business is not required to provide the certification listed above because (select one):

- ☐ My business is not a for-profit "Company" as defined above, pursuant to Texas Government Code §808.001 and §2271.001.
- ☐ My Company has less than 10 full-time employees
- ☐ This is not an agreement for goods or services to be provided to the University.

Name _____ Signature _____ Date _____

Certification of No Boycott

No Boycott Energy Company

If Contractor/Vendor is a "Company", as that term is defined in Section 809.001 of the Texas Government Code and is not a sole proprietorship, then Contractor/Vendor certifies and verifies that it: (i) does not boycott energy companies and (ii) will not boycott energy companies during the term of Purchase Order or Contract this Certification is attached to and incorporated into; or (iii) that it meets the requirements of an exception listed below.

Form requirements:

- **This certification is required by Texas Government Code § 2274.002.**
- This form is required to be attached to and is incorporated into all Purchase Orders (goods) and Contracts (services) with a value of $100,000 or more that is paid in whole or in part with state funds with a company with 10 or more full time employees. The campus department making the purchase of goods or contracting for services is responsible for obtaining the form from the Vendor or Contractor.

Texas Government Code §809.001(1) states that "Boycott energy company" means "without an ordinary business purpose, refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations with a company because the company: (A) engages in the exploration, production, utilization, transportation, sale, or manufacturing of fossil fuel-based energy and does not commit or pledge to meet environmental standards beyond applicable federal and state law; or (B) does business with a company described by Paragraph (A)". Furthermore, Texas Government Code §809.001(2) states that the term"Company" means a "for-profit sole proprietorship, organization, association, corporation, partnership, joint venture, limited partnership, limited liability partnership, or limited liability company, including a wholly owned subsidiary, majority-owned subsidiary, parent company, or affiliate of those entities or business associations that exists to make a profit", provided however that Texas Government Code §2274.001(2) excludes sole proprietorships from this definition of "Company".

Vendor/Contractor Name or Company Name	
Street Address	
City	
State	
Zip Code	
Phone Number	
Printed Name of Authorized Representative	
Title of Authorized Representative	
Signature of Authorized Representative	
Date	

ONLY COMPLETE THIS SECTION IF YOU BELIEVE YOU ARE NOT REQUIRED TO PROVIDE THE CERTIFICATION – No Boycott Energy Company - FOR THE REASONS CITED BELOW

My business is not required to provide the certification listed above because (select one):

- ☐ My business is not a for-profit "Company" as defined above, pursuant to Texas Government Code §809.001(2) and §2274.001(2).
- ☐ My Company has less than 10 full-time employees
- ☐ This is not an agreement for goods or services to be provided to the University.

Name _____ Signature _____ Date _____

Certification of No Boycott

No Discrimination against Firearm and Ammunition Industries

If Contractor/Vendor is a "Company", as that term is defined in Section 2274.001 of the Texas Government Code and is not a sole proprietorship, then Contractor/Vendor certifies and verifies that it: (i) does not have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association and (ii) will not discriminate against a firearm entity or firearm trade association during the term of the Purchase Order or Contract this Certification is attached to and incorporated into; or (iii) that it meets the requirements of an exception listed below.

Form requirements:

- **This certification is required by Texas Government Code § 2274.002**
- This form is required to be attached to and is incorporated into all Purchase Orders (goods) and Contracts (services) with a value of $100,000 or more that is paid in whole or in part with state funds with a company with 10 or more full time employees. The campus department making the purchase of goods or contracting for services is responsible for obtaining the form from the Vendor or Contractor.

Texas Government Code §2274.001(3) states that " discriminate against a firearm entity or firearm trade association " means "with respect to the entity or association, to: (i) refuse to engage in the trade of any goods or services with the entity or association based solely on its status as a firearm entity or firearm trade association; (ii) refrain from continuing an existing business relationship with the entity or association based solely on its status as a firearm entity or firearm trade association; or (iii) terminate an existing business relationship with the entity or association based solely on its status as a firearm entity or firearm trade association". Furthermore, Texas Government Code §2274.001(2) states that the term "Company" means a "a for-profit organization, association, corporation, partnership, joint venture, limited partnership, limited liability partnership, or limited liability company, including a wholly owned subsidiary, majority-owned subsidiary, parent company, or affiliate of those entities or associations that exists to make a profit. The term does not include a sole proprietorship."

Vendor/Contractor Name or Company Name	
Street Address	
City	
State	
Zip Code	
Phone Number	
Printed Name of Authorized Representative	
Title of Authorized Representative	
Signature of Authorized Representative	
Date	

ONLY COMPLETE THIS SECTION IF YOU BELIEVE YOU ARE NOT REQUIRED TO PROVIDE THE CERTIFICATION –No Discrimination against Firearm and Ammunition Industries- FOR THE REASONS CITED BELOW

My business is not required to provide the certification listed above because (select one):

- ☐ My business is not a for-profit "Company" as defined above, pursuant to Texas Government Code §2274.001(2).
- ☐ My Company has less than 10 full-time employees
- ☐ This is not an agreement for goods or services to be provided to the University.

Name _____ Signature _____ Date _____

CONFLICT OF INTEREST QUESTIONAIRE

CONFLICT OF INTEREST
DISCLOSURE

IMPORTANT NOTICE TO VENDORS AND BIDDERS- NEW STATE LAW

Beginning January 1, 2006 a new state law (Chapter 176 of the Local Government Code) requires the filing of Conflict of Interest Questionnaires (CIQ) by certain individuals and businesses.

The questionnaires require disclosures describing certain business and gift giving relationships, if any, the filers may have with Local Government Officers or a member of a governing body of a local government entity.

The new law applies to:

- Businesses and individuals who contract with the city,
- Businesses and individuals who seek to contract with the City (regardless of whether a bidder is awarded the contract), and
- Agents who represent such businesses in their business dealing with the City

A copy of the required reporting form is attached. Form CIQ

As part of the contracting process with governmental entities, Section 2252.908 of the Texas Government Code requires that for certain types of contracts, you must fill out a conflict of interest form ("Disclosure of Interested Parties") at the time you submit your signed contract to the District. For further information please go to the Texas Ethics Commission website via the following link.
https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm

If you have any questions about compliance, please consult your own legal counsel. Compliance is the individual responsibility of each individual, business and agent who is subject to the law's filing requirement.

If you are required to file a Conflict of Interest Questionnaire, you should file it with the City's Secretary at 1001 Buchanan Dr. Suite 4, Burnet, Tx 78611.

USE PROJECT ID AND PROJECT NAME WHEN COMPLETING THE ONLINE FORM

CONFLICT OF INTEREST QUESTIONNAIRE

FORM CIQ

For vendor or other person doing business with local governmental entity

This questionnaire reflects changes made to the law by H.B. 1491, 80th Leg., Regular Session.

This questionnaire is being filed in accordance with Chapter 176, Local Government Code by a person who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the person meets requirements under Section 176.006(a).

By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the person becomes aware of facts that require the statement to be filed. *See* Section 176.006, Local Government Code.

A person commits an offense if the person knowingly violates Section 176.006, Local Government Code. An offense under this section is a Class C misdemeanor.

OFFICE USE ONLY

Date Received

1 **Name of person who has a business relationship with local governmental entity.**

2 ☐ **Check this box if you are filing an update to a previously filed questionnaire.**

(The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date the originally filed questionnaire becomes incomplete or inaccurate.)

3 **Name of local government officer with whom filer has employment or business relationship.**

_____

Name of Officer

This section (item 3 including subparts A, B, C & D) must be completed for each officer with whom the filer has an employment or other business relationship as defined by Section 176.001(1-a), Local Government Code. Attach additional pages to this Form CIQ as necessary.

A. Is the local government officer named in this section receiving or likely to receive taxable income, other than investment income, from the filer of the questionnaire?

☐ Yes ☐ No

B. Is the filer of the questionnaire receiving or likely to receive taxable income, other than investment income, from or at the direction of the local government officer named in this section AND the taxable income is not received from the local governmental entity?

☐ Yes ☐ No

C. Is the filer of this questionnaire employed by a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership of 10 percent or more?

☐ Yes ☐ No

D. Describe each employment or business relationship with the local government officer named in this section.

4

Signature of person doing business with the governmental entity _____ Date _____

Adopted 06/29/2007

REQUEST FOR INFORMATION

CMF Project No.:	**RFI Number:**
Project Name:	**Date Received:**
CITY Project Manager:	**Date Required:**
Design Professional:	**Forwarded To:**
Contractor:	**Date Responded:**
Specification No.:	**Page No.:**
check one: ☐ **RFI** ☐ **Design Modification** ☐ **Other**	
check one: ☐ **Standard Specification** ☐ **Supplemental Specification** ☐ **Special Provision**	
Plan Sheet No.:	**Detail:**

REQUEST:

PROPOSED SOLUTION (If applicable):

By: **Signature:** **Date:**

RESPONSE:

By: **Signature:** **Date:**

After reviewing the response, does the contractor anticipate:

That a change order will be required? ☐ **Yes** ☐ **No**

That there will be an increase in the cost of the project? ☐ **Yes** ☐ **NO**

Performance Bond

STATE OF TEXAS

COUNTY OF _____

Bond No. _____

Project No. _____

Project Name _____

Know All Men By These Presents: That _____

of the City of _____, County of _____, and

State of _____, as Principal, and _____,
a solvent company authorized under laws of the State of Texas to act as Surety on bonds for principals, are held and

firmly bound unto _____ (Owner), in the penal sum of

_____

_____ U.S. Dollars ($ _____ U.S.) for payment whereof, well and truly to be made, said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, by these presents:

Conditions of this Bond are such that, whereas, Principal has entered into a certain written contract with OWNER, dated

the _____ day of _____, _____, which Agreement is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

Now, therefore, the condition of this obligation is such, that if said Principal shall faithfully perform said Agreement and shall in all respects duly and faithfully observe and perform all and singular covenants, conditions and agreements in and by said contract agreed and covenanted by Principal to be observed and performed, and according to true intent and meaning of said Agreement hereto annexed, then this obligation shall be void; otherwise to remain in full force and effect.

Provided, however, that this bond is executed pursuant to provisions of Chapter 2253, Texas Government Code as amended and all liabilities on this bond shall be determined in accordance with provisions of said Article to same extent as if it were copied at length herein.

Surety, for value received, stipulates and agrees that any change in Contract Time or Contract Sum shall not in anywise affect its obligation on this bond, and it does hereby waive notice of any such change in Contract Time or Contract Sum.

In witness whereof, said Principal and Surety have signed and sealed this instrument this _____

day of _____ , _____.

_____	_____
Principal	Surety
By_____	By _____
Title_____	Title _____
Address_____	Address _____
_____	_____
_____	_____
	Telephone _____ Fax _____
	E-Mail Address _____

Name and address of Resident Agent of Surety:

_____

_____

Note: Bond shall be issued by a solvent Surety company authorized to do business in Texas, and shall meet any other requirements established by law or by Owner pursuant to applicable law. A copy of surety agent's "Power of Attorney" must be attached hereto.

Payment Bond

STATE OF TEXAS
COUNTY OF _____

Bond No.
Project No.
Project Name

Know All Men By These Presents: That _____ of the City of _____, County of_____ and State of Texas, as Principal, and _____a solvent corporation authorized under laws of the State of Texas to act as Surety on bonds for principals, are held and firmly bound unto _____(Owner), and all Subcontractors, workers, laborers, mechanics and suppliers as their interests may appear, all of whom shall have right to sue upon this bond in the penal sum of_____U.S. Dollars ($_____U.S.), for payment whereof, well and truly to be made, said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, by these presents:

Conditions of this Bond are such that, whereas, Principal has entered into a certain written contract with Owner; dated the _____ day of _____, _____ to which Agreement is hereby referred to and made a part hereof as fully and to the same extent as if copied in length herein.

Now, therefore, condition of this obligation is such, that if the said Principal shall well and truly pay all Subcontractors, workers, laborers, mechanics, and suppliers, all monies to them owing by said Principals for subcontracts, work, labor, equipment, supplies and materials done and furnished for the construction of improvement of said Agreement, then this obligation shall be and become null and void; otherwise to remain in full force and effect.

Provided, however, that this bond is executed pursuant to provisions of Chapter 2253, Texas Government Code as amended and all liabilities on bond shall be determined in accordance with provisions of said Article to same extent as if it were copied at length herein.

Surety, for value received, stipulates and agrees that any change in Contract Time or Contract Sum shall not in anywise affect its obligation on this bond, and it does hereby waive notice of any such change in Contract Time or Contract Sum.

In witness whereof, said Principal and Surety have signed and sealed this instrument this _____ day of _____, _____.

Principal
By_____
Title_____
Address_____
Telephone _____
Fax _____
E-Mail Address _____

Surety
By_____
Title _____
Address _____
Telephone _____
Fax _____
E-Mail Address _____

Name and address of the Resident Agent of Surety:
_____
_____

Note: Bond shall be issued by a solvent Surety company authorized to do business in Texas, and shall meet any other requirements established by law or by Owner pursuant to applicable law. A copy of surety agent's "Power of Attorney" must be attached hereto.

Maintenance Bond

STATE OF TEXAS

COUNTY OF _____

Bond No. _____

Project No. _____

Project Name _____

Know All Men By These Presents: That _____

of the City of _____, County of _____, and

State of _____, as Principal, and _____, **a solvent company authorized under laws of the State of Texas** to act as Surety on bonds for principals, is licensed and have an office in Texas are held and firmly bound unto City of Burnet (Owner or Obligee), in the penal sum of_____

_____ U.S. Dollars ($ _____ U.S.) for payment whereof, well and truly to be made, said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, by these presents:

Conditions of this Bond are such that, whereas, Principal has entered into a certain written contract with OWNER, dated the _____ day of _____, _____, which Agreement is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

Whereas, the penal sum above is intended to represent ten percent (10%) of the total sum of the contractual obligation to the Owner.

Whereas, the said Principal has completed and the Owner has accepted as being complete in accordance with applicable construction documents (this bond shall become effective only after such completion and acceptance) infrastructure improvements (Described as "Work") project contractually known as: _____

Whereas, the Owner requires that the principal furnish a bond conditioned to guarantee for the period of One (1) years after Owner has accepted as being complete in accordance with applicable construction documents, against any defects in workmanship and materials which are the responsibility of the Principal.

Now, therefore, the condition of this obligation is such, that said Principal shall indemnify the Obligee for all loss that the Obligee may sustain by reason of defective materials or workmanship which may become apparent before the expiration of the period of One (1) year after Owner has accepted as being complete in accordance with applicable construction documents. In the event that Principal does not make necessary repairs in a timely manner, then this bond to remain in full effect.

This obligation does not cover normal wear and tear of materials, misuse by Obligee or third party, failure of Owner to perform owner required maintenance, not any defects not addressed and known to Obligee prior to acceptance, nor any defects discovered or occurring after the expiration period set above.

Provided, however, that this bond is executed pursuant to provisions of Chapter 2253, Texas Government Code as amended and all liabilities on this bond shall be determined in accordance with provisions of said Article to same extent as if it were copied at length herein.

In witness whereof, said Principal and Surety have signed and sealed this instrument this _____

day of _____ , _____.

_____	_____
Principal	Surety
By_____	By _____
Title_____	Title _____
Address_____	Address _____
_____	_____
_____	_____
	Telephone _____ Fax _____
	E-Mail Address _____

Name and address of Resident Agent of Surety:

_____

_____

Note: Bond shall be issued by a solvent Surety company authorized to do business in Texas, and shall meet any other requirements established by law or by Owner pursuant to applicable law. A copy of surety agent's "Power of Attorney" must be attached hereto.

DRAFT

AIA® Document A101® – 2017

Standard Form of Agreement Between Owner and Contractor

where the basis of payment is a Stipulated Sum

AGREEMENT made as of the «30 » day of «September » in the year «2023 »
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

«City of Burnet, Texas »« »
«1001 Buchanan Drive, Suite 4 »
«Burnet, TX 78611 »
« »

and the Contractor:
(Name, legal status, address and other information)

« »« »
« »
« »
« »

for the following Project:
(Name, location and detailed description)

«Burnet City Hall»
«301 E. Jackson St,
Burnet, Texas»
«New City Hall for Burnet, Texas. The project is approx. 16,500 SF and will house the development services, court, city council chambers, administrative offices, finance, and support spaces.
»

The Architect:
(Name, legal status, address and other information)

«SEAUX-PIERCE Architecture »« »
«1014 Sailmaster Street »
«Austin, TX 78734 »
« »

The Owner and Contractor agree as follows.

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.

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

The parties should complete A101®–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201®–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[« »] The date of this Agreement.

[«X »] A date set forth in a notice to proceed issued by the Owner.

[« »] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

« »

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

[«X »] Not later than the number of days specified in the Construction Duration Form of the Bid Documents or as subsequently agreed upon by both parties.

[« »] By the following date: « »

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be « » ($ « »), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price
n/a	

§ 4.4 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

« Contractor acknowledges and agrees that the Owner will suffer financial loss in an amount that is difficult to quantify if the Project is not Substantially or Finally Completed on the dates set forth in the Contract Documents. Accordingly, the Owner may assess liquidated damages against the Contractor (and its surety) in an amount equal to $500.00 per day, as a fixed, agreed, and liquidated damages and not a penalty, for each day of delay until substantial completion. Further Contractor acknowledges and agrees the amount of liquidated damages called for herein is a reasonable forecast of just compensation in the event of delay of Substantially or Finally Completion. The right to assess liquidated damages is in addition to, and not in limitation of, any right or remedy available to the Owner. »

§ 4.6 Other:

(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

« »

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

« »

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the « 30th » day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the « 30th » day of the «following » month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than « forty » («40 ») days after the Architect receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

Notwithstanding the foregoing, all payments shall be made by the City in accordance with the Texas Prompt Payment Act, Texas Government Code, Chapter 2251, which shall control in the event of any conflict.

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

- **.1** That portion of the Contract Sum properly allocable to completed Work;
- **.2** That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- **.3** That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

- **.1** The aggregate of any amounts previously paid by the Owner;
- **.2** The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;
- **.3** Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- **.4** For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and
- **.5** Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

«10% »

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

«N/A »

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

« N/A »

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

« »

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

« »

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

« » % « »

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

« »
« »
« »
« »

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[« »] ~~Arbitration pursuant to Section 15.4 of AIA Document A201–2017~~

[« X»] Litigation in a court of competent jurisdiction

[« »] ~~Other *(Specify)*~~

~~« Binding arbitration if subsequently agreed to by both parties under terms then determined to apply or, in the event of non-agreement, litigation in a court of competent jurisdiction. »~~

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

« »

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

«David Vaughn »
«City of Burnet »
«P.O. Box 1369 »
«1001 Buchanan Drive #4 »
«Burnet, TX 78611 »
« »

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

« »
« »
« »
« »
« »
« »

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds.
§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

« N/A »

§ 8.7 Other provisions:

« »

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

« N/A »

.5 Drawings

Number	Title	Date
Refer to Project Manual – SCH	Schedule of Drawings	9-15-2023

.6 Specifications

Section	Title	Date	Pages
Divisions 00-32	Project Manual	9-15-2023	811

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[« »] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

«N/A »

[« »] The Sustainability Plan:

Title	Date	Pages

[« X »] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages
1. Supplementary conditions address by AIA Document A-201 additions and deletions.	Other Conditions		

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

« 1) Bid Documents
2) City of Burnet Approved Standard Construction Specifications»

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
« David Vaughn»«, City Manager »	« »« »
(Printed name and title)	*(Printed name and title)*

DRAFT AIA® Document A101® – 2017 Exhibit A

Insurance, Indemnity and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the « » day of « » in the year « »
(In words, indicate day, month and year.)

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

«Burnet City Hall»
«301 E. Jackson St,
Burnet, Texas»

THE OWNER:
(Name, legal status and address)

«City of Burnet, Texas »« »
«1001 Buchanan Drive, Suite 4
Burnet, TX 78611 »

THE CONTRACTOR:
(Name, legal status and address)

« »« »
« »

TABLE OF ARTICLES

ARTICLE A.1 GENERAL

The Owner and Contractor shall purchase and maintain insurance, and Contractor shall provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term Agreement refers to the AIA Document A101 – 2017 Standard Form Agreement between Owner and Contractor, and General Conditions refers to AIA Document A201™–2017, General Conditions of the Contract for Construction.

ARTICLE A.2 OWNER'S INSURANCE – The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement, General Conditions, or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

ARTICLE A.3 CONTRACTOR'S INSURANCE and BONDS

§ A.3.1 General

§ A.3.1.1 Certificates of Insurance Prior to the commencement of any work under this Contract, Contractor shall furnish an original completed Certificate(s) of Insurance to the Burnet City Manager, which shall be clearly labeled "*City of Burnet, Texas, City Hall Project*" in the Description of Operation block of the Certificate. The original certificate(s) shall be completed by an agent authorized to bind the named underwriter(s) and their company to the coverage, limits, and termination provisions shown thereon, containing all required information referenced or indicated thereon. The original certificate(s) or form must have the agent's original signature, including the signer's company affiliation, title, and phone number, and be mailed directly from the agent to the Owner. The Owner shall have no duty to pay or perform under this Contract until such certificate shall have been delivered to the Burnet City Manager, and no officer or employee, other than the City Council, shall have authority to waive this requirement.

§ A.3.1.2 Additional Insurance Obligations.
§ A.3.1.2.1 The Owner reserves the right to review the insurance requirements of this Article during the effective period of this Contract and any extension or renewal hereof and to modify insurance coverage and their limits when deemed necessary and prudent, but in no instance will Owner allow modifications whereupon Owner may incur increased risk.

§ A.3.1.2.2 The Contractor is required to obtain Worker's Compensation Insurance for the duration of the Work.

§ A.3.1.2.3 The Aggregate Limits of Insurance required by Section A.3.2.1.1 shall apply, in total, to this Contract only. This shall be indicated on the insurance certificate or an attached policy amendment.

§ A.3.2 Contractor's Required Insurance Coverage

§ A.3.2.1 Subject to Contractor's right to maintain reasonable deductibles, in such amounts as are approved by the Owner, Contractor shall obtain and maintain in full force and effect for the duration of this Contract, and any extension hereof, at Contractor's sole expense, insurance coverage written on an occurrence policy, and not a claims made

policy, by companies authorized and submitted to do business in the State of Texas and rated A- or better by A.M. Best Company and/or otherwise acceptable to the Owner.

§ A.3.2.1.1 Liability Insurance shall include all major divisions of coverage and be on a Commercial basis including the following:

(1) Premises - Operations.
(2) Independent Contractor's Protective.
(3) Products and Completed Operations.
(4) Personal and Advertising Injury.
(5) Contractual, including specified provision for Contractor's obligations under Paragraph 3.18.
(6) Broad Form Property Damage including Completed Operations.
(7) Owned, Non-owned and Hired Motor Vehicles.

The insurance required by Subparagraph A.3.2.1.1 shall be written for not less than the following limits, or greater if provisions of this Contract:

(1) COMMERCIAL GENERAL LIABILITY:
  (a) General Aggregate (per project) $2,000,000
  (b) Products/Completed Operations $1,000,000
  (c) Personal and Advertising Injury $1,000,000
  (d) Each Occurrence $1,000,000
  (e) Fire Damage (Any one fire) $100,000
  (f) Medical Expense (Any one person) $5,000

(2) BUSINESS AUTO LIABILITY (including All Owned, Non-owned, and Hired Vehicles):
  (a) Combined Single Limit $1,000,000
  OR
  (b) Bodily Injury & Property Damage (each) $750,000

(3) WORKER'S COMPENSATION:
  (a) State Statutory
  (b) Employers Liability $100,000 Per Accident
  $500,000 Disease, Policy Limit
  $100,000 Disease, Each Employee

§ A.3.2.1.3 PROPERTY INSURANCE

§ 11.2.2.1 The Contractor shall purchase sufficient Builder's Risk and other property insurance necessary to protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work.

§ 11.2.2.2 Contractor's Builder's Risk and other property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit. Coverage shall be written on an occurrence basis and shall be maintained without interruption from date of commencement of the Work until date of final payment and termination of any coverage required to be maintained after final payment.

§ A.3.2.2 The Owner shall be entitled, upon request and without expense, to receive copies of the policies and all endorsements thereto as they apply to the limits required by the Owner, and may require the deletion, revision, or modification of particular policy

terms, conditions, limitations or exclusions (except where policy provisions are established by law or regulation binding upon either of the parties hereto or the underwriter of any such policies). Contractor shall be required to comply with any such requests and shall submit a copy of the replacement certificate of insurance to Owner, at the address provided in § A.3.2.5, herein within 10 days of the requested change. Contractor shall pay any costs incurred resulting from said change.

§ A.3.2.3 Contractor agrees that with respect to the above required insurance, all insurance contracts and Certificate(s) of Insurance will contain the following required provisions:

(a) Name the Owner and its officers, employees, volunteers, and elected representatives as additional insureds with respect to operations and activities of, or on behalf of, the named insured performed under contract with the Owner, with the exception of the workers' compensation and professional liability policies;

(b) The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations; and the policy shall provide for an endorsement that the "*other insurance*" clause shall not apply to the Owner.; and

(c) Workers' compensation and employers' liability policies will provide a waiver of subrogation in favor of the Owner.

§ A.3.2.4 When there is a cancellation, non-renewal or material change in coverage which is not made pursuant to a request by Owner, Contractor shall notify the Owner of such and shall give such notices not less than thirty (30) days prior to the change, if Contractor knows of said change in advance, or ten (10) days notice after the change, if the Contractor did not know of the change in advance. Such notice shall be given to the Owner at the following address:

City of Burnet, Texas
%City Manager
P.O. Box 1369
1001 Buchanan Drive
Suite 4
Burnet, Texas 78023

§ A.3.2.5 If Contractor fails to maintain the aforementioned insurance, or fails to secure and maintain the aforementioned endorsements, the Owner may obtain such insurance, and deduct and retain the amount of the premiums for such insurance from any sums due under the Contract; however, procuring of said insurance by the Owner is an alternative to other remedies the Owner may have, and is not the exclusive remedy for failure of Contractor to maintain said insurance or secure such endorsements. In addition to any other remedies the Owner may have upon the Contractor's failure to provide and maintain any insurance or policy endorsements to the extent and within the

time herein required, the Owner shall have the right to order Contractor to stop work hereunder, and/or withhold any payment(s) which become due to Contractor hereunder until Contractor demonstrates compliance with the requirements hereof.

§ A.3.2.6 Nothing herein contained shall be construed as limiting in any way the extent to which Contractor may be held responsible for payments of damages to persons or property resulting from Contractor's or its subcontractors' performance of the work covered under this Contract.

§ A.3.2.7 It is agreed that Contractor's insurance shall be deemed primary with respect to any insurance or self insurance carried by the Owner for liability arising out of operations under this Contract.

§ A.3.3 Contractor's Other Insurance Coverage – Intentionally deleted.

§ A.3.4 Performance Bond, Payment Bond, and Warranty Bond

§ A3.4.1 Contractor shall, with the execution and delivery of the Contract, furnish and file with Owner, in the amounts required in this § A.3.4, The bond shall be in favor of Owner and shall be executed by an approved surety company authorized to do business in the State of Texas as provided in § A.3.4.1 and § A.3.4.2. Said surety bonds shall be as follows:

(a) PERFORMANCE BOND. A good and sufficient bond in an amount equal to one hundred percent (100%) of the total Contract Sum, guaranteeing the full and faithful execution of the Work and performance of the Contract in accordance with Plans, Specifications, and all other Contract Documents, including any extensions thereof, for the protection of Owner.

(b) PAYMENT BOND. A good and sufficient bond in an amount equal to one hundred percent (100%) of the total Contract Sum, guaranteeing the full and prompt payment of all claimants supplying labor or materials in the prosecution of the Work provided for in the Contract, and for the use and protection of each claimant.

(c) WARRANTY/MAINTENANCE BOND. Prior to approval or acceptance of the work by Owner, Contractor shall furnish a warranty/maintenance bond in form and substance acceptable to Owner, in the amount of ten percent (10%) of the contract amount of the Improvements, insuring the repair and replacement of all defects due to faulty material and workmanship that appear within one (1) year from the date of acceptance (the "*Substantial Completion*" date).

§ A.3.4.1 Each surety bond shall be signed by Contractor, as the Principal, as well as by an established corporate surety bonding company as surety, meeting the requirements of Section A.3.4.2 herein and approved by Owner. The surety bonds shall

be accompanied by an appropriate Power-of-Attorney clearly establishing the extent and limitations of the authority of each signer to so sign.

§ A.3.4.2 No surety will be accepted by Owner that is in default, delinquent on any bonds or that is a party to any litigation against Owner. All bonds shall be made and executed on forms approved by Owner and shall be executed by not less than one (1) corporate surety that is authorized and admitted to do business in the State of Texas, is licensed by the State of Texas to issue surety bonds, is listed in the most current United States Department of the Treasury List of Acceptable Sureties and is otherwise acceptable to Owner. Each bond shall be executed by Contractor and the surety and shall specify that legal venue for enforcement of each bond exclusively shall lie in Travis, Williamson, or Burnet County, Texas. Each surety shall designate an agent resident in Travis, Williamson, or Burnet County, Texas to which any requisite statutory notices may be delivered and on which service of process may be had in matters arising out of the suretyship.

ARTICLE A.4 Special Terms and Conditions – Intentionally deleted.

DRAFT

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

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

«Burnet City Hall»
«301 E. Jackson St,
Burnet, Texas»

THE OWNER:
(Name, legal status and address)

«City of Burnet, Texas »« »
«1001 Buchanan Drive, Suite 4
Burnet TX. 78611 »

THE ARCHITECT:
(Name, legal status and address)

«Seaux-Pierce Architecture »« »
«1014 Sailmaster Street, Lakeway TX. 78734 »

TABLE OF ARTICLES

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.

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

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

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INDEX
(Topics and numbers in bold are Section headings.)

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Exhibit A to 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. The Contract Documents ~~do not~~ includes the advertisement or invitation to bid, Instructions to Bidders, sample forms, other written 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 or proposal requirements.

§ 1.1.2 The Contract

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

§ 1.1.3 The Work

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

§ 1.1.4 The Project

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

§ 1.1.5 The Drawings

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

§ 1.1.6 The Specifications

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

§ 1.1.7 Instruments of Service

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

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the Architect who shall render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

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

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.1.2 In general, the Drawings are intended to establish the location, quantity and relationship of Work, and the Specifications are intended to define the type and quality of materials and workmanship requirements of the Work shown. In cases of conflict between the Drawings and Specifications or with either, the Contractor shall submit prompt request for information/ direction to the Architect before proceeding, in accordance with Sections 4.2.11, 4.2.12 and 4.2.14.

§ 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.

§ 1.2.4 Before bidding, ordering any material or doing any Work, each contractor shall verify all measurements and conditions, existing and new, at the jobsite and be responsible for the correctness of the same. No extra charge or compensation will be allowed on account of difference between actual dimensions and conditions and the ones indicated on the Drawings.

§ 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 retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and 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 the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, 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 suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

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

§ 2.1.2 Intentionally deleted.

§ 2.1.3 The Owner reserves the right to observe the Work at any time. The presence of the Owner or its representatives at the project site does not imply concurrence or approval of the Work. The Contractor shall call specific items to the attention of the Architect if the Contractor requires information/direction.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract in accordance with Texas Business and Commerce Code §56.054(e).

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 Intentionally deleted.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements,

assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

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

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

§ 2.3.4 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.

§ 2.3.5 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.

§ 2.3.6 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.

§ 2.4 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.

§ 2.5 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 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 default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

§ 2.5.1 If, after achieving Substantial Completion, the Contractor then defaults, or neglects to complete or fails to provide resources adequate to complete the Project within the adjusted Contract Time for ~~Final~~ Substantial Completion as defined in Subparagraph 8.1.1, the Owner may carry out the work after giving the Contractor a single seven-day written notice of the Contractor's default or neglect. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor or its Surety shall pay the difference to the Owner. If Contractor disagrees with the actions of the Owner, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express

authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

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

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

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 The Contractor acknowledges that it has taken steps reasonably necessary to ascertain the nature and location of the Work, and that it has investigated and satisfied itself as to the general and local conditions which can affect the Work or its cost, including but not limited to: (1) conditions bearing upon transportation, disposal, handling, and storage of materials; (2) the availability of labor, water, electric power, and roads; (3) uncertainties of weather, river stages, tides, or similar physical conditions at the site; (4) the conformation and conditions of the ground; and (5) the character of equipment and facilities needed preliminary to and during Work performance. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by the Owner, as well as from the Drawings and Specifications made a part of this Contract. Any failure of the Contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from responsibility for estimating properly the difficulty and cost of successfully performing the Work, or for proceeding to successfully perform the Work without additional expense to the Owner.

§ 3.2.1.1 The Owner assumes no responsibility for any conclusions or interpretations made by the Contractor based on the information made available by the Owner. Nor does the Owner assume responsibility for any understanding reached or representation made concerning conditions which can affect the Work by any of its officers or agents before the execution of this Contract, unless that understanding, or representation is expressly stated in this Contract.

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

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

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit 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, subject to Section 15.1.7, 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. If the Contract Documents give

specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be 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 notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

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

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

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

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

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

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner that all materials and equipment furnished under the Contract shall be in specified condition and quality and shall be new unless otherwise required or permitted by the Contract Documents; that the Work will be free from defects not inherent in the quality required or permitted; and that the Work will conform to the requirements of the Contract-Documents. The Contractor further warrants that all workmanship shall be of the specified quality and in accordance with the Contract Documents and shall be performed by persons qualified at their respective trades. This warranty shall extend for the entire period described in Section 12.2.2. However, unless caused by the Contractor, the Contractor's warranty excludes remedy for damage or defect caused by abuse, the modifications not performed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Owner or the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

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

§ 3.6.1 Article 3.6 notwithstanding, the Owner, as a political subdivision of the State, is exempt from the payment of Texas Sales Tax on materials required for the Work and the ~~GMP~~ Contractor shall not include taxes for which the Owner is exempt. . Texas limited sales tax exemption certificates will be furnished upon request. If billed, the Owner will remit payment less sales tax.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building

permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded. The Contractor shall be responsible for payment of any charges imposed for excessive re-inspections. For purposes of this Section 3.7.1, excessive shall mean any inspections in excess of two inspections necessitated by factors within the control of the Contractor.

§ 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 that the Contractor knows or reasonably should have known to be contrary to applicable laws, statutes, ordinances, codes, rules or regulations, or lawful orders of public authorities, the Contractor shall assume responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

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

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

§ 3.9 Superintendent

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

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.2.1 The Contractor shall notify the Owner, in writing through the Architect, of any proposed change in superintendent, including the reason therefore, prior to making such change. The superintendent shall not be changed except with the consent of the Owner, which shall not be unreasonably withheld.

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

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.1.2 The construction schedule shall provide a graphic representation of activities and events that will occur during performance of the Work in sufficient detail to show the sequencing of the various trades for each floor level, wing, or work area.

§ 3.10.1.3 The construction schedule shall set forth dates that are critical in ensuring the timely and orderly completion of the Work in accordance with the requirements of the Contract Documents.

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

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

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

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

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

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

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

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such 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.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately 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 and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and 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.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

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

§ 3.14 Cutting and Patching

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

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its 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 and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

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

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

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

§ 3.18 Indemnification

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

compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

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

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. Notwithstanding these responsibilities, no act or omission by the Architect shall be considered a waiver of any of the Owner's rights or interests.

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

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

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

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to

permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

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

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

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

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

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

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

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

§ 4.2.15 In the Specifications or on the Drawings, where the words "as directed," "as required," "as approved," "as permitted" or words of like effect are used, it is to be understood that direction, requirement, approval or permission of the Architect is intended. Similar words, such as "approved," "acceptable," "satisfactory," or words of like import mean approved by, acceptable to, or satisfactory to the Architect."

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

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

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

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the

Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

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

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

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

§ 5.2.5 The Contractor is responsible for determining that all of the Contractor's Subcontractors are duly licensed in accordance with the federal, state and local licensing laws.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights. 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.

§ 5.3.1 Intentionally deleted.

§ 5.3.2 Without limitation on the generality of the foregoing, each Subcontract agreement and each Sub-subcontract agreement shall include, and shall be deemed to include, the following:

- **.1** A provision providing that the Owner is a third-party beneficiary of the Subcontract (or Sub-subcontract), entitled to enforce any rights thereunder for its benefit, and that the Owner shall have the same rights and remedies against the Subcontractor (or Sub-subcontractor) as the Contractor (or Subcontractor) has, including but not limited to the right to be compensated for any loss, expense, or damage of any nature whatsoever incurred by the Owner resulting from any breach of representations and warranties, expressed or implied, if any, arising out of the agreement and any error, omission, or negligence of the Subcontractor (or Sub- subcontractor) in the performance of any of its obligations under the agreement; and,
- **.2** A provision providing that the Subcontractor (or Sub-subcontractor) shall promptly disclose to the Contractor (or Subcontractor) any defect, omission, error, or deficiency in the Contract Documents or in the Work of which it has, or should have had knowledge; and,
- **.3** A provision incorporating the following Sections of these General Conditions of the Contract: Sections 3.2, 3.5., 3.18, and 5.4.

§ 5.3.3 The Contractor shall assure the Owner, by affidavit or in such other manner as the Owner may approve, that all agreements between the Contractor and its Subcontractor(s) incorporate the provisions of Subparagraph 5.3.2 as necessary to preserve and protect the rights of the Owner and the Architect under the Contract Documents with respect to the work to be performed by Subcontractors so that the subcontracting thereof will not prejudice such rights.

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

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

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

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

§ 6.2 Mutual Responsibility

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

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall

constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

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

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

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

§ 6.2.6 The Contractor and each Separate Contractor shall together, and without reliance on the Owner's or Architect's determination, establish the conditions of the premises before commencement of the Work on each such separate contract, and the parties shall adjust all claims for damages to each others' work between themselves, but the Owner may withhold the value of all such corrections from payments to both contractors pending settlement of disputes between the contractors concerning such damage.

§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

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

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

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

§ 7.2 Change Orders

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

- **.1** The change in the Work;
- **.2** The amount of the adjustment, if any, in the Contract Sum; ~~and~~
- **.3** The extent of the adjustment, if any, in the Contract Time; and
- **.4** Agreement on any Change Order shall constitute a mutual release by the Contractor and the Owner for any and all liability under this Contract attributable to such facts or circumstances giving rise to the Change Order.

§ 7.3 Construction Change Directives

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

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

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

- **.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 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

- **.1** Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- **.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, directly related to the change; and
- **.5** Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

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

§ 7.3.7 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.

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

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

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

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

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.

§ 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, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

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

§ 8.2.4 Failure by the Contractor to commence actual physical work on the Project within ten (10) days from the date of commencement, unless agreed otherwise, will entitle the Owner to consider the Contractor in substantial breach of its obligations under this Contract. In this event, the Owner may terminate the Contract in accordance with the Contract Documents.

§ 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 (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, delays caused by governmental entities (e.g. inspections) or utility providers, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine (provided such delay is not attributable to, caused by the negligence or wrongful acts of, or resulting from the failure of Contractor or its Subcontractors, Suppliers, or Sub-subcontractors of any tier to comply with their obligations arising under the Contract). Contractor shall give the Owner written notice of any such delay, including delay caused by the Architect, as soon as possible but in any event within seventy-two (72) hours of the beginning of the claimed delay.

§ 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.

§ 8.3.4 Contractor has taken into account Contractor's expected downtimes due to typical weather conditions for the location of the Project at the time that the work is performed, or recognized holidays. The Contractor's failure to properly staff the job, failure to manage the work, or failure to allow for normal, seasonable weather delays shall not entitle the Contractor to additional Contract Time. No extensions of Contract Time due to weather delays shall be considered by the Owner unless the Owner is satisfied that the weather was significantly severe and unusual for long

periods of time in which the Work is performed and that the overall Project Contract Time was, in fact, truly impacted by the severe and unusual weather." The ~~GMP Amendment~~ Agreement shall include the project schedule and the amount of weather days included in the schedule. In the event of a delay described in Section 8.3.1, Contractor shall be entitled to an extension of the Contract Time and a corresponding increase in the Contract Sum for Contractor's extended general conditions costs.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 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.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

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

§ 9.3 Applications for Payment

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

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

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or 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, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

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

§ 9.5 Decisions to Withhold Certification

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

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers 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 either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

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

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier 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 Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

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

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

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

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and 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 and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to 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 or provided by 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, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

Notwithstanding the other provisions of this Article 9, the Owner's payments obligations hereunder, including the time of payment and the payment of interest on overdue amounts, are subject to Chapter 2251, Texas Government Code; and time for payment shall be determined by §2251(a)(3) therein.

§ 9.8 Substantial Completion

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

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of

items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

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

§ 9.8.3.1 Inspection and testing shall take place at a time(s) mutually agreeable to the Contractor, Owner and Architect.

§ 9.8.3.2 The inspection shall include a demonstration by the Contractor that all equipment, systems, and operable components of the Work function properly and in accordance with the Contract Documents. The Contractor shall furnish access for the inspection and testing as provided in this Contract. The inspection and testing shall determine whether Substantial Completion has been accomplished and shall result in the Architect's issuance of a written list of unfinished Work and defective Work, commonly referred to as a "punch list", each item of which must be finished and corrected prior to Final Completion.

§ 9.8.3.3 The Architect and its consultants shall conduct all Substantial Completion inspections. The Owner may elect to have other persons of its choosing participate in the inspections. Representatives of other authorities having jurisdiction may be present, at their sole discretion, at the Substantial Completion inspection or otherwise inspect the completed Work and advise the Owner whether the Work meets their respective requirements.

§ 9.8.3.4 If the inspection discloses any item which is not in accordance with the requirements of the Contract Documents and will prevent the Owner from occupying or utilizing the Work for its intended use, the Contractor shall complete or correct such item upon notification by the Architect. The Contractor shall then submit a request for a follow-up inspection by the Architect to determine Substantial Completion.

§ 9.8.3.5 The Contractor shall proceed promptly and diligently to complete and correct items on the list of unfinished or defective Work. 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.

§ 9.8.3.6 If more than two (2) Substantial Completion inspections are required, the Contractor shall reimburse the Owner for all costs of any subsequent reinspection if the circumstances necessitating the reinspection are based on factors within the Contractor's control (i.e.: work not completed, defective work, etc.) or, at the Owner's option, the costs may be deducted from payments due to the Contractor.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and 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 the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the 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 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance,

heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.~~10~~9.1.1 Final Completion shall be achieved no later than thirty (30) days after Substantial Completion unless modified by a Change Order.

§ 9.~~10~~9.1.2 The Contractor shall notify the Owner, in writing of the date when the Work has reached or will reach Final Completion and will be ready for final inspection and testing. The notice shall be given at least ten (10) days in advance of said date and shall be forwarded through the Architect, who will attach its endorsement as to whether or not it concurs in the Contractor's statement that the Work will be ready for inspection and testing on the date stated. The Architect's endorsement is a convenience to the Owner only and shall not relieve the Contractor of its responsibility in the matter, nor shall the Architect's endorsement be deemed to be evidence that the Work was finally complete and ready for inspection and testing. In the event that the Architect does not concur with the Contractor's statement, the Architect shall inform the Contractor of the basis for the Architect's non-concurrence. The Contractor may then, at its sole option, (1) defer the inspection; or, (2) request the inspection be performed in accordance with this Subparagraph. The final inspection and testing shall be conducted in the same manner as the inspection for Substantial Completion, including, but not limited to, the requirements of Clauses 9.8.3.3, 9.8.3.4, 9.8.3.5 and 9.8.3.6 of this Contract.

§ 9.~~10~~9.1.3 In the event that the Architect does not find the Work acceptable under the Contract Documents and the Contract fully performed, the Contractor shall then submit a request for a follow-up inspection in accordance with and subject to Section 9.10.1.2 to determine Final Completion. If more than two (2) Final Completion inspections are required, the Contractor shall reimburse the Owner for all costs of reinspection if the circumstances necessitating the reinspection are based on factors within the Contractor's control (i.e.: work not completed, defective work, etc.) or, at the Owner's option, the costs may be deducted from payments otherwise due to the Contractor.

§ 9.~~10~~9.1.4 Approval of Work at or as a result of any inspection required herein shall not release the Contractor or its surety from responsibility for complying with the Contract. including but not limited to the warranty referenced therein.

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

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

§ 9.10 Final Completion and Final Payment

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

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no 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, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and 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, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance 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 the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

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

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

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents;
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment; or
- **.5** or claims otherwise reserved in writing and contemporaneously sent with final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a 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.

§ 9.10.6 The Contractor shall keep full and accurate records of all costs incurred and items billed in connection with the performance of the Work, including records of subcontractors, which records shall be open to audit by the authorized representative of the Owner or the Owner during the performance of the Work and for twelve (12) months after Final Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

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

§ 10.2 Safety of Persons and Property

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

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

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

§ 10.2.3 The Contractor shall implement, 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 the owners and users of adjacent sites and utilities of the safeguards.

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

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

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

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

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the 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 and Substances

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

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

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

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous 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 hazardous 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 reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse 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. Written notice of the emergency, including an estimate of cost and probable effect of delay on the progress of the Work, shall be given by the Contractor to the Architect as soon as possible, but in no case more than three (3) days after the start of the emergency.

ARTICLE 11 INSURANCE AND BONDS This Article 11 is deleted in its entirety and the subject matter (Insurance and Bonds) is addressed in Exhibit A to the Agreement.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, including inspections of work-in-progress required by all authorities having jurisdiction over the Project, then the portion of Work so covered shall, upon demand of the Architect or the authority having jurisdiction, be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

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

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any 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 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 at its sole discretion either (i) correct it in accordance with Section 2.5 or (ii) require the Warranty/Maintenance Bond surety to correct the work.

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

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

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

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, 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, excluding that jurisdiction's choice of law rules and venue for any claim or cause of action shall lie within Burnet County, Texas, , or in the United States District Court for the Western District of Texas, Austin Division.

§ 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 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 the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 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.

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

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect

timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

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

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

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

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest at a rate determined in accordance with the Texas Prompt Payment Act, Texas Government Code, Chapter 2251.

§ 13.6 Contract requirements for subdivisions of Texas state government

§ 13.6.1 Under Texas law, Owner may not enter into a contract with a company for goods and services unless the contract contains a written verification from the company that of the following: (i) the company neither Boycotts Israel; nor will not Boycott Israel during the term of the contract (Chapter 2271, Texas Government Code); (ii) the company is neither identified on a list prepared and maintained by the comptroller; nor does business with Iran, Sudan, or a foreign terrorist organization (Chapter 2252, subchapter F, Texas Government Code); (iii) the company neither has a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association; nor will not discriminate during the term of the contract against a firearm entity or firearm trade association (Chapter 2274, Texas Government Code); and (iv) neither boycott energy companies; nor will not boycott energy companies during the term of the contract (Chapter 2274, Texas Government Code).

The signatory executing this contract on behalf of Contractor verifies that the Contractor, at the time of execution of this Contract is, and during the term of this Contract shall be, in full compliance with the requirements of Chapters 2270, 2252 subchapter F, and 2274 Texas Government Code as those chapters apply to the matters discussed in the paragraph above.

§ 13.6.2 For certain contracts needing City Council approval, the Owner may not accept or enter into a contract until it has received from the Contractor a completed Texas Ethics Commission ("TEC") Form 1295 complete with a certificate number assigned by the TEC pursuant to Texas Government Code § 2252.908 and the rules promulgated thereunder by the TEC. The Contractor understands that failure to provide said form complete with a certificate number assigned by the TEC may prohibit the Owner from entering into this Contract.

§ 13.6.3 The signing parties to this agreement do not intend to confer any rights upon any persons not a party to this Contract. Accordingly, this Contract shall not be construed to create any third-party beneficiaries.

§ 13.6.4 Contractor and Subcontractors shall comply with Texas Government Code, Chapter 2258, as amended, in performing on this Project, if applicable. In accordance with Chapter 2258, as amended, the prevailing wage rates as

set forth in the Contract shall be paid on this Project and shall be posted at the job site or other area generally accessible to the employees working on the Project. In the event that the Contractor or Subcontractor seeks to hire a craft or type of worker not listed in the wage rates ~~set forth in this Contract, such entity shall, in advance of hiring the worker, request an official determination of the prevailing wage rate for the craft or type of worker from the Owner~~. For overtime work and legal holidays, the hourly rate shall be one and one-half times the basic hourly rate set forth in the schedule of prevailing wage rates, which is incorporated herein for all purposes.

§ 13.6.4.1 The Contractor and any Subcontractor(s) shall keep a record showing the name, occupation, and actual per diem wages paid each worker employed by the Contractor or Subcontractor in the construction of the Project. The Owner may require an affidavit stating that the Contractor has complied with the prevailing wage rate provisions of the Contract prior to acceptance of the Project or at any time during or after completion of the Contract.

§ 13.6.4.2 The Owner reserves the right to conduct interviews with the Contractor's and Subcontractor's employees to insure compliance with Texas Government Code, Chapter 2258, as amended, and with all applicable local, state and federal laws. Upon written request by Owner, the Contractor shall be responsible for submitting the above required records to the Owner for all employees performing work on the Project, whether employed by the Contractor or a Subcontractor. Each submittal shall be certified by the Contractor as to completeness and accuracy.

§ 13.6.4.3 A Contractor in violation of Texas Government Code, Chapter 2258, as amended, is liable for a penalty as provided therein. Nothing herein shall preclude the Contractor or Subcontractor from paying higher wages than specified herein.

§ 13.6.4.4 In the event that Owner receives written information or complaint attesting to a violation of the prevailing wage rate, Owner shall proceed under Texas Government Code, Chapter 2258.

§ 13.~~10~~6.4.5 Contractor acknowledges and agrees that Contractor is required by Texas Local Government Code, Section 176.006 to complete a conflict-of-interest questionnaire, if applicable to the Contractor. This obligation shall be ongoing throughout the term of this Contract.'

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, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- **.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- **.2** An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- **.3** Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- **.4** The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, 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' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work 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' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor:

.1 fails to complete the Work within the Contract Time specified in the Contract Documents, including any authorized adjustments; or

.2 fails to make payment to Subcontractors Suppliers for materials or labor,-in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;

.3 repeatedly (defined as occurring on two or more occasions) disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority having jurisdiction; or

.4 fails to comply with any of the other material provisions of this Contract.

§ 14.2.2 The Owner's right to terminate this Contract under Subparagraph 14.2.1 may be exercised if the Contractor does not cure such failure within seven (7) days (or more if authorized in writing by the Owner) after receipt of the notice from the Owner specifying the general nature of the failure. The Owner shall notify the Contractor's surety within a reasonable time. When terminating pursuant to Paragraph 14.2.1, the Owner may, without prejudice to any other rights or remedies of the Owner, and subject to any prior rights of the surety:

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

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

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

§ 14.3 Suspension by the Owner for Convenience

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

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

.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

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

§ 14.4.2 Upon receipt of 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 Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

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, a change in the Contract Time, 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. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall 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, unless this time period is otherwise altered by the Contract Documents.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 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.

§ 15.1.6.2 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.

§ 15.1.7 Waiver of 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 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, 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 to litigation of any Claim unless thirty (30) days have passed after the Claim has been referred to the the Architect and no decision has been rendered in writing. The Architect 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) forward the claim to Owner with a recommendation that the claim be approved, (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.

§ 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 the 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 Architect will either reject the Claim or forward the Claim to the Owner with recommendation that the Claim be approved 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, 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 as provided in Section 15.3 below. If the parties fail to resolve their dispute through mediation, ~~to binding~~ or other dispute resolution agreed to by the parties, either party may proceed with litigation in a court of competent jurisdiction.

§ 15.2.6 Intentionally deleted.

§ 15.2.6.1 Intentionally deleted.

§ 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 Intentionally deleted.

§ 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 15.1.7, shall be subject to non-binding mediation as a condition precedent to any other form of dispute resolution or litigation.

§ 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, and delivered to the other party to the Contract, within thirty (30) days of the date of the Initial Decision Maker's decision provided under Section 15.2.5 above; and shall subsequently be filed with the person or entity administering the mediation.

§ 15.3.3 Intentionally deleted.

§ 15.3.4 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 Intentionally deleted.

END OF BID DOCUMENTS - DIVISION 00

SEAUX PIERCE
ARCHITECTURE

PROJECT DIRECTORY

SEAUX-PIERCE Project # 2021-16

New City Hall

Burnet, Texas

OWNER
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MEP
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LANDSCAPE
MPLA Landscape Architecture
301 W. Creek Street
Fredericksburg, Tx 78624
(830) 992-3710
Attn: Marcus Parker, Pla

Section SCH – Schedule of Drawings

	ARCHITECTURAL		ISSUED	REVISED
1	G0.1	PROJECT INFORMATION	9/15/2023	
2	G.1	TAS 01	9/15/2023	
3	G.2	TAS 02	9/15/2023	
4	G.3	CODE ANALYSIS	9/15/2023	
5	G.4	LIFE SAFETY SHEET (ADDED PER PLAN REVIEW)	9/15/2023	
6	A0.1	SITE PLAN	9/15/2023	
7	A0.2	SITE DETAILS	9/15/2023	
8	A0.3	SITE DETAILS	9/15/2023	
9	A1.1	P-TYPES	9/15/2023	
10	A1.2	DOOR TYPES | SCHEDULES	9/15/2023	
11	A1.3	GLASS PARTITION TYPES | SCHEDULES	9/15/2023	
12	A1.4	WINDOW OPENING TYPES | SCHEDULES	9/15/2023	
13	A1.5	DOOR & WINDOW DETAILS	9/15/2023	
14	A2.1	FLOOR PLAN SHELL	9/15/2023	
15	A2.2	FLOOR PLAN	9/15/2023	
16	A2.3	ROOF PLAN	9/15/2023	
17	A2.4	ENLARGED FLOOR PLAN	9/15/2023	
18	A2.5	ROOM FINISH	9/15/2023	
19	A2.6	RCP	9/15/2023	
20	A3.1	EXTERIOR ELEVATIONS	9/15/2023	
21	A4.1	BUILDING SECTIONS	9/15/2023	
22	A4.2	WALL SECTIONS	9/15/2023	
23	A4.3	WALL SECTIONS	9/15/2023	
24	A4.4	PLAN DETAILS	9/15/2023	
25	A5.1	INTERIOR ELEVATIONS	9/15/2023	
26	A5.2	INTERIOR ELEVATIONS	9/15/2023	
27	A5.3	INTERIOR ELEVATIONS	9/15/2023	
28	A5.4	INTERIOR ELEVATIONS	9/15/2023	
29	A5.5	INTERIOR ELEVATIONS	9/15/2023	
30	A5.6	INTERIOR ELEVATIONS	9/15/2023	
31	A5.7	INTERIOR ELEVATIONS	9/15/2023	
32	A6.1	INTERIOR DETAILS	9/15/2023	
33	A6.2	INTERIOR DETAILS	9/15/2023	
34	A7.1	3D VIEWS	9/15/2023	

	LANDSCAPE		ISSUED	REVISED
1	L1.1	LANDSCAPE MATERIALS PLAN	5/19/2023	
2	L1.2	LANDSCAPE MATERIALS PLAN ENLARGEMENT AT PLAZA	5/19/2023	
3	L2.1	LANDSCAPE LAYOUT PLAN	5/19/2023	
4	L2.2	LANDSCAPE LAYOUT PLAN ENLARGEMENT AT PLAZA	5/19/2023	
5	L3.1	LANDSCAPE PLANTING PLAN	5/19/2023	
6	L3.2	LANDSCAPE PLANTING PLAN ENLARGEMENT AT PLAZA	5/19/2023	
7	L4.1	DIAGRAMMATIC IRRIGATION PLAN	5/19/2023	
8	L4.2	DIAGRAMMATIC IRRIGATION PLAN ENLARGEMENT AT PLAZA	5/19/2023	
9	L5.1	FOUNTAIN PLAN OVERVIEW AT PLAZA	5/19/2023	
10	L5.2	FOUNTAIN PLANS AND SECTIONS	5/19/2023	

Section SCH – Schedule of Drawings

11	L5.3	FOUNTAIN - ELECTRICAL AND BONDING NOTES	5/19/2023	

STRUCTURAL			ISSUED	REVISED
1	S0.01	STRUCTURAL GENERAL NOTES	5/19/2023	
2	S0.02	ABBREVIATIONS & LEGENDS	5/19/2023	
3	S1.01	AXONOMETRIC VIEWS	5/19/2023	
4	S2.01	FOUNDATION PLAN	5/19/2023	
5	S2.02	ROOF FRAMING PLAN	5/19/2023	
6	S2.03	HIGH ROOF FRAMING PLAN	5/19/2023	
7	S3.01	BRACED FRAME ELEVATIONS	5/19/2023	
8	S3.02	BRACED FRAME DETAILS	5/19/2023	
9	S4.01	TYPICAL FOUNDATION DETAILS	5/19/2023	
10	S4.02	TYPICAL FOUNDATION DETAILS	5/19/2023	
11	S4.10	FOUNDATION DETAILS	5/19/2023	
12	S4.11	FOUNDATION DETAILS - SITE RETAINING WALLS	5/19/2023	
13	S7.01	TYPICAL BASE PLATE AND HSS COL. STEEL DETAILS	5/19/2023	
14	S7.02	TYPICAL STEEL BEAM CONNECTION DETAILS	5/19/2023	
15	S7.03	TYPICAL ROOF K OWSJ DETAILS	5/19/2023	
16	S7.10	FRAMING DETAILS	5/19/2023	
17	S9.01	TYPICAL COLD-FORMED STEEL DETAILS	5/19/2023	
18	S9.02	TYPICAL COLD-FORMED STEEL DETAILS	5/19/2023	

MEP			ISSUED	REVISED
1	M0.00	MECHANICAL GENERAL NOTES	5/19/2023	
2	M2.11	MECHANICAL DUCTWORK PLAN - AREA A	5/19/2023	
3	M2.12	MECHANICAL DUCTWORK PLAN - AREA B	7/21/2023	
4	M2.13	MECHANICAL DUCTWORK PLAN - AREA C	5/19/2023	
5	M2.14	MECHANICAL DUCTWORK PLAN - AREA D	5/19/2023	
6	M2.21	MECHANICAL PIPING PLAN - AREA A	5/19/2023	
7	M2.22	MECHANICAL PIPING PLAN - AREA B	7/21/2023	
8	M2.23	MECHANICAL PIPING PLAN - AREA C	5/19/2023	
9	M2.24	MECHANICAL PIPING PLAN - AREA D	5/19/2023	
10	M3.00	MECHANICAL ROOF PLAN	5/19/2023	
11	M5.00	MECHANICAL DETAILS	5/19/2023	
12	M5.01	MECHANICAL DETAILS	6/30/2023	
13	M6.00	MECHANICAL SCHEDULES	5/19/2023	
14	M6.01	MECHANICAL SCHEDULES	7/21/2023	
15	M7.00	MECHANICAL RISER DIAGRAMS - VRF-1	5/19/2023	
16	M7.01	MECHANICAL RISER DIAGRAMS - VRF-2	5/19/2023	
17	P0.00	PLUMBING GENERAL NOTES	5/19/2023	
18	P1.01	PLUMBING SITE PLAN	6/30/2023	
19	P2.11	PLUMBING PLAN - SANITARY DRAIN AND VENT - AREA A	5/19/2023	
20	P2.12	PLUMBING PLAN - SANITARY DRAIN AND VENT - AREA B	7/21/2023	
21	P2.13	PLUMBING PLAN - SANITARY DRAIN AND VENT - AREA C	5/19/2023	
22	P2.14	PLUMBING PLAN - SANITARY DRAIN AND VENT - AREA D	5/19/2023	
23	P2.21	PLUMBING PLAN - DOMESTIC WATER - AREA A	5/19/2023	

Section SCH – Schedule of Drawings

24	P2.22	PLUMBING PLAN - DOMESTIC WATER - AREA B	7/21/2023	
25	P2.23	PLUMBING PLAN - DOMESTIC WATER - AREA C	5/19/2023	
26	P2.24	PLUMBING PLAN - DOMESTIC WATER - AREA D	5/19/2023	
27	P5.00	PLUMBING DETAILS	5/19/2023	
28	P5.01	PLUMBING DETAILS	6/30/2023	
29	P6.00	PLUMBING SCHEDULES	7/21/2023	
30	P7.00	PLUMBING RISER DIAGRAMS	7/21/2023	
31	E0.00	ELECTRICAL GENERAL NOTES	5/19/2023	
32	E1.01	ELECTRICAL SITE PLAN	6/30/2023	
33	E1.02	ELECTRICAL SITE PHOTOMETRIC PLAN	5/19/2023	
34	E2.11	ELECTRICAL LIGHTING PLAN - AREA A	5/19/2023	
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END OF SCHEDULE

GEOTECHNICAL ENGINEERING
DRILLING & SAMPLING
FOUNDATION DESIGN

HOLT ENGINEERING, INC.

CONSTRUCTION INSPECTION
LABORATORY TESTING
MATERIALS TESTING

26 January 2023

City of Burnet
1001 Buchanan Drive, Suite 4
Burnet, Texas 78611

Attn: Mr. David Vaughn

Re: Burnet City Hall
303 East Jackson Street
Burnet, Texas

File No: 01-00323

Dear Mr. Vaughn:

Enclosed please find a copy of our Subsurface Investigation and Foundation Recommendations Report for the above referenced project.

Should you have any questions concerning our report or if we can be of further service, please do not hesitate to call.

Sincerely,

Steve B. Johnson, P.E.
Geotechnical Division Manager

Holt Engineering, Inc.
TBPE Firm Registration No. F-430

Enc.: Engineering Report
Invoice

SUBSURFACE INVESTIGATION

AND

FOUNDATION RECOMMENDATIONS

FOR

BURNET CITY HALL

303 EAST JACKSON STREET

BURNET, TEXAS

REPORT FOR:

CITY OF BURNET

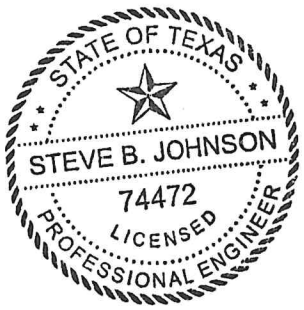
1001 BUCHANAN DRIVE, SUITE 4

BURNET, TEXAS 78611

PREPARED BY:

M. ANTONIO GONZALEZ
GRADUATE ENGINEER

STEVE B. JOHNSON, P.E.
GEOTECHNICAL DIVISION MANAGER



HOLT ENGINEERING, INC.
TBPE FIRM REGISTRATION NO. F-430

FILE NO. 01-00323
26 JANUARY 2023

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SUBSURFACE INVESTIGATION
AND
FOUNDATION RECOMMENDATIONS
FOR
BURNET CITY HALL
303 EAST JACKSON STREET
BURNET, TEXAS

INTRODUCTION

An exploration of subsurface soil conditions was performed for the proposed Burnet City Hall to be located at 303 East Jackson Street in Burnet, Texas. Mr. David Vaughn, City Manager for the City of Burnet, authorized the investigation on 19 December 2022 in accordance with our proposal. The purpose of this investigation is to determine subsurface conditions and materials at the site in order to establish design and construction recommendations for the project's foundation system.

SCOPE

Our investigation consisted of the following:

A. Laying out and drilling seven borings to depths ranging from 19 feet to 25 feet below existing grade.
B. Logging the borings in the field and making a visual reconnaissance of the area's terrain.
C. Taking samples of selected subsurface soils for laboratory tests.
D. Laboratory testing includes moisture content, Atterberg limits, minus No. 200 mesh sieve tests and Unconfined compression tests.
E. Performing field tests.
F. Providing foundation recommendations based on engineering analysis of field notes and laboratory test results.

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SITE DESCRIPTION

The proposed Burnet City Hall is to be located at 303 East Jackson Street in Burnet, Texas. The site consists of a commercial lot covered in native grasses with few small to large trees. Two single-story structures currently exist at the north end of the property. An asphalt parking lot also exists on the property. The terrain is relatively level across the site.

FIELD TEST AND SAMPLING

The borings were made with a CME 55 truck mounted drilling rig. The holes were drilled using 4-inch diameter flight augers. The soil conditions were logged, and materials visually classified by the soils engineer in the field. Disturbed samples were taken, and standard penetration tests were performed using a 2-inch O.D. split-barrel sampler driven by a 140-pound hammer dropping a distance of 30 inches. The number of blows to drive the sampler 12 inches is recorded and shown on the attached Logs of Borings.

LABORATORY TESTS

The following laboratory tests were run on selected samples:

1. Moisture Content (ASTM D2216)
2. Minus 200-Mesh Sieve (ASTM D4222)
3. Atterberg Limits (ASTM D4318)

These tests were performed together with visually inspecting and classifying the soils in general accordance with ASTM D2487 and described as recommended in ASTM D2488. Results of these tests were used to determine the foundation design criteria such as bearing capacity and the potential for settlement or heave.

SUBSURFACE CONDITIONS

The approximate locations of the borings are shown in the attached Generalized Boring Location Plan. A general description of the soil conditions is given below. A detailed depiction of the soil conditions is given in the Logs of Borings found in the Appendix.

In general dark brown lean clay is found on the surface and extends to depths ranging

from 6 inches to 2 feet. The dark brown lean clay overlies reddish-brown clayey sand which extends to depths ranging from 4 feet to 18.5 feet and overlies tan and reddish-brown clayey sand. The tan and reddish-brown clayey sand extends to depths ranging from 8.5 feet to 13.5 feet and overlies tan clayey sand. In boring B-01, the tan and reddish-brown clayey sand overlies reddish-brown lean clay, which extends to a depth of 17 feet and overlies tan limestone rock. The tan clayey sand extends to depths ranging from 12 feet to 18 feet and overlies tan limestone rock. In boring B-03, the reddish-brown clayey sand extends to a depth of 18 feet and overlies tan limestone rock. The tan limestone rock extends to the termination of the borings at depths ranging from 19 feet to 25 feet below existing grade. In boring B-06, the tan clayey sand overlies reddish-brown fat clay to a depth of 19.5 feet and overlies reddish-brown lean clay, which extends to the termination of the boring at a depth of 25 feet below existing grade. In boring B-07, the tan clayey sand overlies reddish-brown clayey sand, which extends to the termination of the boring at a depth of 25 feet below existing grade.

The fill material consists of unclassified brown and tan very silty clay and light reddish-brown silt with small to medium sized rock and limestone rocks. The surficial dark brown lean clay is low to moderate in plasticity with plasticity indices (P.I.'s) ranging from 7 to 13. The reddish-brown clayey sand dense, fine, and moderate to high in plasticity with P.I.'s ranging from 22 to 34. The reddish-brown and tan clayey sand dense, fine, and is low to moderate in plasticity with P.I.'s ranging from 6 to 14. The tan clayey sand is medium dense, fine, and low to moderate in plasticity with P.I.'s ranging from 7 to 12. The reddish-brown lean clay is low in plasticity with P.I of 19. The reddish-brown fat clay is high in plasticity with a P.I. of 44. The tan limestone rock is hard to very hard and contains interbedded silt layers.

Groundwater was not encountered during the drilling operation; however, groundwater levels will vary with seasonal weather conditions.

POTENTIAL VERTICAL MOVEMENT

The potential vertical movement for the underlying clay soils at this site has been estimated using the general guidelines presented in the Texas Department of Transportation

(TxDOT) test method TEX-124-E. The Texas Department of Transportation method utilizes the liquid limits and plasticity indices for soils in the seasonally active zone, estimated to be about 15 feet in the project area.

The estimated potential vertical movement value provided is based on the proposed floor system applying a sustained surcharge load of approximately 1.0 lb. per square inch on the subgrade materials. Potential vertical movement on the order of two inches was estimated for the soil conditions encountered at this site.

The PVR value is based on the current site grades. Higher PVR values than the above-mentioned value will occur in areas where water is allowed to pond for extended periods.

DISCUSSION AND RECOMMENDATIONS

It is our understanding the project will consist of a single-story structure for the new city hall. We expect the structure will be wood or steel framed with masonry veneer. Finished floor elevations have not been established at this time; however, we expect less than 3 feet of fill material will be necessary to level the site.

The primary concern for the foundations is the moderately expansive reddish brown clayey sand encountered in the top 1 foot to 6 feet in our borings. After removal of the top 36 inches of existing fill material, dark brown lean clay, and reddish-brown clayey sand, the soils encountered in our borings are suitable for a shallow foundation consisting of continuous wall footings with a soil supported floor slab. Perimeter beams should be seated 12 inches into undisturbed soil at a minimum depth of 48 inches below existing grade and sized for an allowable bearing value of 2,500 PSF. Heavy column loads should be carried on widened grade beams or spot footings seated 12 inches below the grade beams into undisturbed soil, and sized for an allowable bearing value of 3,000 PSF. In lieu of deep grade beams or square footings, drilled piers may be used and sized for an allowable bearing value of 5,000 PSF when seated at a minimum depth of 10 feet below existing grade. Piers must be straight and plumb, and poured the same day they are drilled. Piers must be inspected by the geotechnical engineer full-time during drilling. The floor slab is soil supported with a grid system of intermediate stiffening beams.

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In order to minimize floor slab movement, we recommend the building pad be prepared by removing a minimum of the top 36 inches of existing fill material, dark brown lean clay and reddish-brown clayey sand, and any organic soils then replacing with a low P.I. (P.I. 3 to 18) select fill. There should be a minimum of 36 inches of select fill below the floor slab. The exposed subgrade and all fill should be compacted in 8-inch lifts to a minimum of 95% of the maximum dry density in accordance with TxDOT test method TEX-113-E. Soil moisture should be within 3% of optimum. Assuming the above pad preparation is followed, we estimate the floor slab movement to be on the order of one inch.

Careful consideration must be given to designing sidewalks, porches, patios and all flat work. All entities supported on grade must be completely separated from the foundation system supported by piers. Concrete flat work should be designed for differential movement up to approximately 2 inches. However, if the building pad select fill is extended beyond the edge of the exterior flatwork, then movement will be reduced to one inch or less.

Landscaping and drainage conditions must also be given careful consideration. The yard should be sloped for positive drainage away from the foundation. Sprinkler systems near the foundation should be avoided. Gutters and downspouts should be installed where necessary to prevent ponding near the foundation. Maintaining the soil moisture around the foundation to uniform moisture condition is essential for a stable foundation system.

No groundwater was encountered during our drilling; however, the borings were not monitored over an extended period and some groundwater seepage may be expected after heavy rains. Provisions for pumping of pier holes should be included in the bid documents. If excessive sloughing occurs, then casing of pier holes will be necessary.

We request to review the final grading plan and foundation drawings to verify our recommendations are properly interpreted and to make suggestions for changes and improvements if necessary.

SPECIFIC FOUNDATION RECOMMENDATIONS

Shallow Foundation System:

This foundation consists of continuous reinforced concrete spread footings (perimeter beams) with a soil supported floor slab.

1. Building Pad – Remove all fill material, dark brown lean clay, reddish-brown

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clayey sand, and any organic soils to minimum depth of 36 inches, then replace with a low P.I. (P.I. 3 to 18) select fill (see attached Select Fill Specifications). There should be a minimum of 36 inches of select fill below the floor slab. The select fill should extend a minimum of 5 feet beyond the edge of the building and any flatwork connected to the building. Compact the exposed subgrade and all fill to a minimum of 95% of the optimum dry weight in accordance with TxDOT test method TEX-113-E. Compaction moisture should be within 3% of optimum.

2. Beams and Floor Slab – Trench for perimeter beams (wall footings) and stiffening beams. Select fill will be necessary to level the site and all perimeter beams and footings must extend through the fill and into undisturbed soil. Place a high quality (10 mil or thicker) vapor barrier between foundation and base material. Immediately after placing reinforcing steel, pour beams and floor slab monolithically. Building pad moisture should be maintained in a uniform condition.

3. Soil Bearing Pressure and Seating Depths – Perimeter beams should be seated 12 inches into undisturbed soil at a minimum depth of 48 inches below existing grade and sized for an allowable bearing value of 2,500 PSF. Heavy column loads should be carried on widened grade beams or square footings 12 inches below the grade beams and sized for an allowable bearing value of 3,000 PSF. In lieu of deep grade beams or square footings, drilled piers may be used and sized for an allowable bearing value of 5,000 PSF when seated at a minimum depth of 10 feet below existing grade.

4. Inspection – All pier holes should be inspected and seated by the soils engineer to verify bearing strata, depth, reinforcement, plumbness and cleanliness of hole. Full-time inspection is required during pier drilling. Subgrade and fill material should be tested by the testing laboratory for proper compaction and moisture content. All perimeter beams or footings should be inspected by the soils engineer to verify proper seating depth and bearing strata prior to concrete placement.

5. Drainage – Slope grounds away from foundation to provide rapid drainage.

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SEISMIC DESIGN

The building should be designed and constructed to resist the effects of earthquake motions in accordance with the International Building Code (IBC). Based on our test borings, we recommend seismic site soil classification "D". Based on this site classification and building risk category III, we recommend the following values for spectral response acceleration from Section 1613.3 "Seismic Ground Motion Values" from the 2015 Edition of the IBC. The values below were computed from the SEAOC and OSHPD Seismic Design Maps website. SEAOC and OSHPD developed this web interface that uses the USGS web services and retrieve the seismic design data and presents it in a report format. A summary of the calculations is presented in Table 1 below, and additional information is provided in the Appendix.

Table 1 – Seismic Parameters

S_S =	0.058 g	S_{MS} =	0.093 g	S_{DS} =	0.062 g
S_1 =	0.033 g	S_{M1} =	0.079 g	S_{D1} =	0.053 g

Seismic Design Category - Based on the above response acceleration values the more severe design category was determined in accordance with Table 1613.3.5(1) or 1613.3.5(2). Therefore, the Seismic Design Category is "A". We are providing this soil design classification and the seismic design parameters as a courtesy to the design structural engineer based on the sources stated above. The structural engineer is ultimately responsible for verifying these values are consistent with the seismic data for the area in question and also for the adequacy of the spectral response calculations.

QUALITY CONTROL PROGRAM

We recommend a Quality Control Program be implemented by the Owner or Architect to inspect the construction of the foundation and framing to verify all work is being performed in accordance with the approved engineered drawings and specifications. The inspections should include (but not limited to) preparation of the building pad subgrade and placement and compaction of all fill material to verify proper density and moisture content.

Inspections should be conducted on all foundation beams, piers and footings to verify proper bearing and seating depth. Where drilled piers are used, or driven piles are installed then full-time inspection is recommended to verify proper bearing capacity is achieved. Pre-pour inspections should be made in order to verify proper placement of the reinforcement. All concrete should be inspected during placement for proper slump, air-content and temperature. Test cylinders should be made to verify compressive strength. All plumbing should be leak tested both before slab is poured and after concrete is placed. Framing should be inspected to verify all floor trusses and roof members (trusses) are placed in accordance with the approved drawings. Anchor bolts and wind bracing should also be inspected. Welding and bolting on structural steel framing and connections should be inspected by a certified welding inspector. Reports of all inspections and tests should be forwarded to the Owner, Architect, Engineer, and Contractor. We can provide these services upon request.

LIMITATIONS

This geotechnical report has been prepared for the exclusive use of our client and the client's authorized design team in preparing the appropriate design and construction documents for this project. It is not intended for any other person's benefit. This report is based on specific project information provided by the client and/or design team as described herein. Any changes in the structure, loadings, building footprint, configuration, finished floor elevations or grades should be brought to our attention so that we may determine what impact the change may have on our conclusions and recommendations. We expect to review the final grading plan and structural drawings to verify our recommendations are properly interpreted.

Our analyses and recommendations are based on subsurface conditions encountered in our borings. Variations in soil conditions may occur between borings. If during construction the soil strata are found to differ from that reported here, we should be notified immediately. This report contains soil-boring logs which are for the purpose of arriving at foundation design criteria and are not to be used by the excavation and/or pier drilling contractor in arriving at rock hardness or rock depth.

The presence or absence of water in our borings might not represent the groundwater

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conditions under all seasonal conditions. No long-term groundwater monitoring was performed in the preparation of this report.

This report is based on conditions that exist on the site at the time of our investigation. Changes to the project, the building site or adjacent properties may affect the reliability of our report. We expect the structures addressed in our report to be started or substantially completed within approximately 24 months of the issuance of our report. The geotechnical report and specific recommendations will need to be re-evaluated if building construction is delayed by more than 24 months from the time of our report. Our report should not be used if the elapsed time of substantial completion exceeds 5 years without review or written consent from Holt Engineering, Inc.

The procedures, tests and recommendations of this investigation and report have been conducted and furnished in accordance with generally accepted professional engineering practices in the field of foundations, engineering soil mechanics and engineering geology. No other warranty is either expressed or implied.

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APPENDIX

ITEM 1

SELECT FILL SPECIFICATIONS

SELECT FILL

Select fill as called for on the plans shall meet one of the following requirements (% Passing or % Retained) as verified by the Engineer when properly slaked and tested by standard laboratory methods:

	% Retained	Or	% Passing
2 ½" Screen	0%		100%
1 ½" Screen	0% - 25%		75% - 100%
7/8" Screen	15% - 55%		45% - 85%
No. 4 Sieve	45% - 75%		25% - 55%
No. 40 Sieve	60% - 90%		10% - 40%

Material passing the No. 40 sieve shall have a minimum plasticity index of 3 and shall not have a plasticity index of greater than 18.

COMPACTION OF FILL

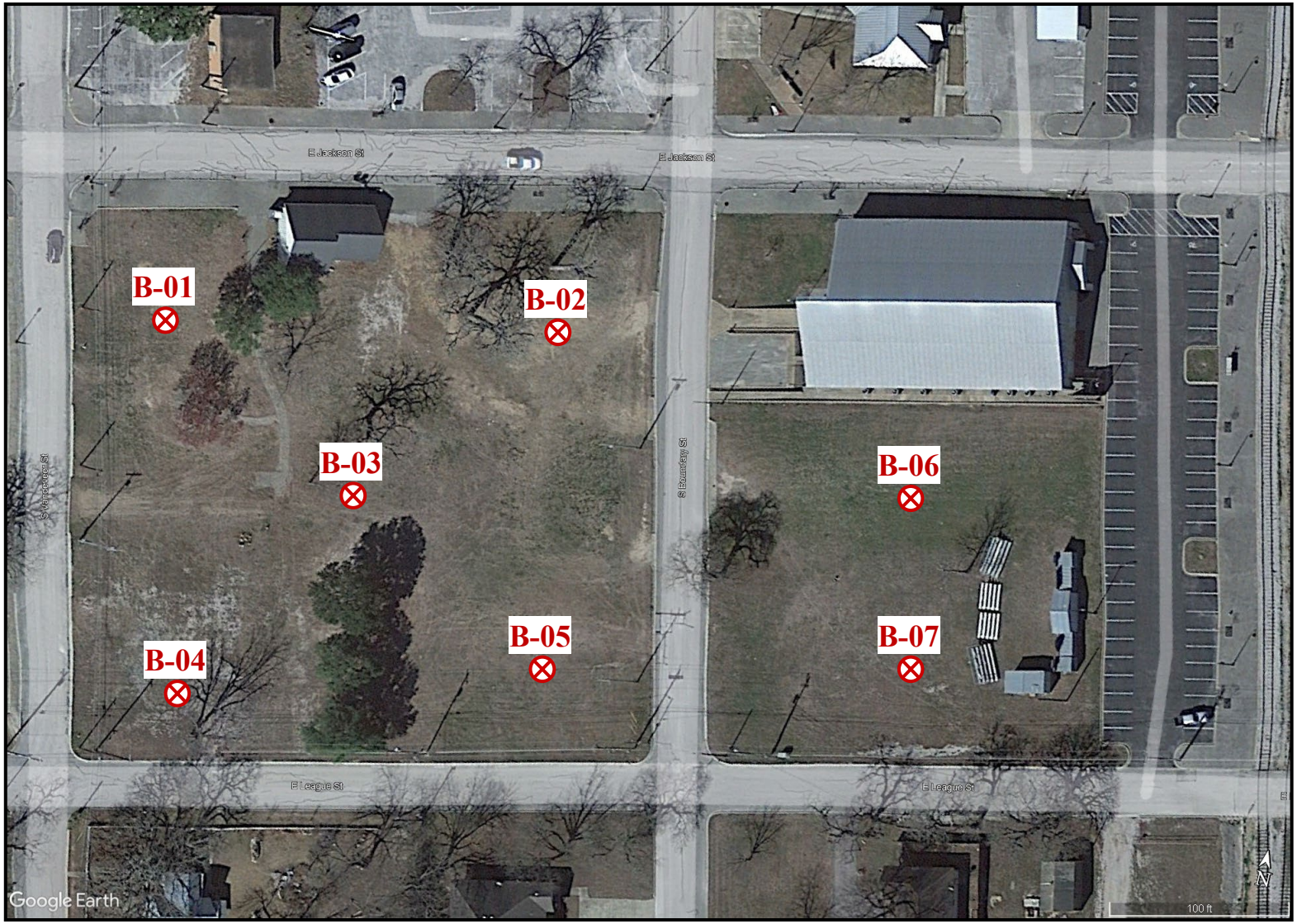
Select fill shall be placed in lifts not to exceed 8 inches loose measure and compacted to 95% or greater of the maximum dry density as determined in accordance with TxDOT test method TEX 113E. Field densities shall be checked in accordance with ASTM D-6938 (Nuclear Gauge) to ensure compliance with project specifications.

Select fill should be processed and moisture conditioned as needed to meet requirements of project moisture specifications.

Samples of fill shall be furnished to the testing laboratory seven days prior to installation to permit time for specification compliance, inspection, and approval.

APPENDIX

ITEM 2



GENERALIZED BORING LOCATION PLAN
BURNET CITY HALL
303 EAST JACKSON STREET
BURNET, TEXAS

Not to Scale

File No. 01-00323

APPENDIX

ITEM 3

BURNET CITY HALL
303 EAST JACKSON STREET
BURNET, TEXAS

LOG OF BORING B-01

NOTES : Hole dry upon completion of drilling operation.

DATE DRILLED : 12-29-22 | BORING DEPTH : 25.0 FEET

DRILLER : Will McGee | WATER LEVEL : | ELEVATION :

DRILLING METHOD : 4" Flight Augers | LAT.: | LONG.:

DEPTH (feet)	SOIL DESCRIPTION	BLOWS PER FOOT	UCC STR. (TSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	LIQUID LIMIT(%)	PLASTICITY INDEX	% PASSING #200 SIEVE
	Fill - Unclassified light reddish-brown silt, w/ small sized limestone rocks							
	LEAN CLAY (CL), dark brown, very sandy, becoming lighter w/ depth, firm	11		11.6		21	7	35.5
	CLAYEY SAND (SC), reddish-brown, fine, medium dense							
5		27		10.6		39	22	49.4
	CLAYEY SAND (SC), tan & reddish-brown, fine, dense							
	-- 6.0' - 8.0' - medium dense							
	-- 8.0' - 10.0' - medium dense	22						
10	-- 10.0' - 13.5' - dense	50/0"						
	LEAN CLAY (CL), reddish-brown, firm	25		6.6		36	19	57.1
15	-- 15.5' - thin hard limestone layer							
	LIMESTONE, tan, w/ thin fractured layers, very hard	50/1"						
20								
25	Terminated @ 25 feet							
30								

LOG OF BORING 01-00323 - BURNET CITY HALL - 303 EAST JACKSON STREET - BURNET, TEXAS.GPJ HOLT ENGINEERING.GDT 1/26/23

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BURNET CITY HALL
303 EAST JACKSON STREET
BURNET, TEXAS

LOG OF BORING B-02

NOTES : Hole dry upon completion of drilling operation.

DATE DRILLED : 12-29-22 | BORING DEPTH : 19.0 FEET

DRILLER : Will McGee | WATER LEVEL : | ELEVATION :

DRILLING METHOD : 4" Flight Augers | LAT.: | LONG.:

DEPTH (feet)	GRAPHIC LOG	SAMPLE	SOIL DESCRIPTION	BLOWS PER FOOT	UCC STR. (TSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	LIQUID LIMIT(%)	PLASTICITY INDEX	% PASSING #200 SIEVE
			LEAN CLAY (CL), dark brown, very sandy, w/ few scattered small to large sized limestone rocks, fine, firm	27		5.4		18	13	28.7
			CLAYEY SAND (SC), reddish-brown, fine, dense							
5				31		9.4		51	32	34.7
				42		7.1		27	12	47.2
			CLAYEY SAND (SC), tan, dense							
10			-- 10.0' - 12.0' - fine							
			LIMESTONE, tan, w/ thin fractured layers, very hard	50/2"						
15										
				50/0"						
			-- Auger refusal at 19.0'							
20			Terminated @ 19 feet							
25										
30										

LOG OF BORING 01-00323 - BURNET CITY HALL - 303 EAST JACKSON STREET - BURNET, TEXAS.GPJ HOLT ENGINEERING.GDT 1/26/23

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BURNET CITY HALL
303 EAST JACKSON STREET
BURNET, TEXAS

LOG OF BORING B-03

NOTES : Hole dry upon completion of drilling operation.

DATE DRILLED : 12-29-22 | BORING DEPTH : 22.0 FEET

DRILLER : Will McGee | WATER LEVEL : | ELEVATION :

DRILLING METHOD : 4" Flight Augers | LAT.: | LONG.:

DEPTH (feet)	SOIL DESCRIPTION	BLOWS PER FOOT	UCC STR. (TSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	LIQUID LIMIT(%)	PLASTICITY INDEX	% PASSING #200 SIEVE
	LEAN CLAY (CL), dark brown, very sandy, firm							
	CLAYEY SAND (SC), fine, medium dense to dense -- 0.5' - 1.0' - brown -- 1.0' - 18.4' - reddish-brown	15						
5		38		7.2		46	28	32.3
		31						
10								
		50/8"		7.0		25	10	47.2
15								
		50/11"						
	LIMESTONE, tan, w/ few thin fractured layers, very hard							
20		50/0"						
	-- Auger refusal at 22.0' Terminated @ 22 feet							
25								
30								

LOG OF BORING 01-00323 - BURNET CITY HALL - 303 EAST JACKSON STREET - BURNET, TEXAS.GPJ HOLT ENGINEERING.GDT 1/26/23

Holt Engineering Inc.
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BURNET CITY HALL
303 EAST JACKSON STREET
BURNET, TEXAS

LOG OF BORING B-04

NOTES : Hole dry upon completion of drilling operation.

DATE DRILLED : 12-28-22 | BORING DEPTH : 21.0 FEET

DRILLER : Will McGee | WATER LEVEL : | ELEVATION :

DRILLING METHOD : 4" Flight Augers | LAT.: | LONG.:

DEPTH (feet)	SOIL DESCRIPTION	BLOWS PER FOOT	UCC STR. (TSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	LIQUID LIMIT(%)	PLASTICITY INDEX	% PASSING #200 SIEVE
	LEAN CLAY (CL), brown, slightly silty, sandy, firm							
	CLAYEY SAND (SC), reddish-brown, becoming more dense w/ depth, fine, medium dense	22		9.7		52	33	40.6
5		34						
	CLAYEY SAND (SC), reddish-brown & tan, fine, dense							
	CLAYEY SAND (SC), tan, fine, dense	42		5.5		21	7	37.9
10	-- 12.0' - 13.5' - very hard, cemented, w/ thin fractured layers & thin dense tan fine sand layers -- 13.5' - 14.5' - conglomerate, very hard, solid, w/ small sized gravel							
15	-- 14.5' - 16.7' - dense, w/ thin hard cemented sand layers							
	LIMESTONE, tan, w/ thin fractured layers, very hard	50/1"						
20	-- Auger refusal at 21.0' Terminated @ 21 feet							
25								
30								

LOG OF BORING 01-00323 - BURNET CITY HALL - 303 EAST JACKSON STREET - BURNET, TEXAS.GPJ HOLT ENGINEERING.GDT 1/26/23

Holt Engineering Inc.
TBPE Firm Registration No. F-430

BURNET CITY HALL
303 EAST JACKSON STREET
BURNET, TEXAS

LOG OF BORING B-05

NOTES : Hole dry upon completion of drilling operation.

DATE DRILLED : 12-28-22 | BORING DEPTH : 25.0 FEET

DRILLER : Will McGee | WATER LEVEL : | ELEVATION :

DRILLING METHOD : 4" Flight Augers | LAT.: | LONG.:

DEPTH (feet)	SOIL DESCRIPTION	BLOWS PER FOOT	UCC STR. (TSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	LIQUID LIMIT(%)	PLASTICITY INDEX	% PASSING #200 SIEVE
	LEAN CLAY (CL), dark brown, very sandy, coarse, firm							
	CLAYEY SAND (SC), reddish-brown, becoming more dense w/ depth, medium dense	28		10.7		53	34	48.4
5		33						
	CLAYEY SAND (SC), reddish-brown & tan, fine, dense			4.0		20	6	23.3
	-- 9.0' - 10.0' - reddish-brown clay layer	30						
10								
	CLAYEY SAND (SC), tan, fine, medium dense -- 12.5' - 13.0' - very hard, cemented, w/ few thin fractured layers	17		4.8		26	11	38.7
15								
	LIMESTONE, tan -- 17.2' - 20.8' - very hard, w/ fractured stiff tan silt layers	50/1"						
20								
	-- 20.8' - 25.0' - hard, w/ thin fractured layers	50/2"						
25								
	Terminated @ 25 feet							
30								

LOG OF BORING 01-00323 - BURNET CITY HALL - 303 EAST JACKSON STREET - BURNET, TEXAS.GPJ HOLT ENGINEERING.GDT 1/26/23

Holt Engineering Inc.
TBPE Firm Registration No. F-430

BURNET CITY HALL
303 EAST JACKSON STREET
BURNET, TEXAS

LOG OF BORING B-06

NOTES : Hole dry upon completion of drilling operation.

DATE DRILLED : 12-29-22 | BORING DEPTH : 25.0 FEET

DRILLER : Will McGee | WATER LEVEL : | ELEVATION :

DRILLING METHOD : 4" Flight Augers | LAT.: | LONG.:

DEPTH (feet)	SOIL DESCRIPTION	BLOWS PER FOOT	UCC STR. (TSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	LIQUID LIMIT(%)	PLASTICITY INDEX	% PASSING #200 SIEVE
	LEAN CLAY (CL), dark brown, firm							
	CLAYEY SAND (SC), brown, fine, medium dense	6						
	CLAYEY SAND (SC), reddish-brown, fine, medium dense -- 3.0' - 4.5' - medium dense							
5	-- 4.5' - 6.0' - dense	35		6.4		45	27	30.7
	CLAYEY SAND (SC), tan, w/ few thin tan & reddish-brown clayey layers, fine, medium dense	22						
10								
		20		6.8		27	12	45.7
15								
	FAT CLAY (CH), reddish-brown, firm	50/10"		22.0		65	44	68.0
	LEAN CLAY (CL), reddish-brown, sandy, w/ multiple thin medium hard cemented sand layers, fine, firm							
20								
				11.6		47	29	59.8
25	Terminated @ 25 feet							
30								

LOG OF BORING 01-00323 - BURNET CITY HALL - 303 EAST JACKSON STREET - BURNET, TEXAS.GPJ HOLT ENGINEERING.GDT 1/26/23

BURNET CITY HALL
303 EAST JACKSON STREET
BURNET, TEXAS

LOG OF BORING B-07

NOTES : Hole dry upon completion of drilling operation.

DATE DRILLED : 12-30-22 | BORING DEPTH : 25.0 FEET

DRILLER : Will McGee | WATER LEVEL : | ELEVATION :

DRILLING METHOD : 4" Flight Augers | LAT.: | LONG.:

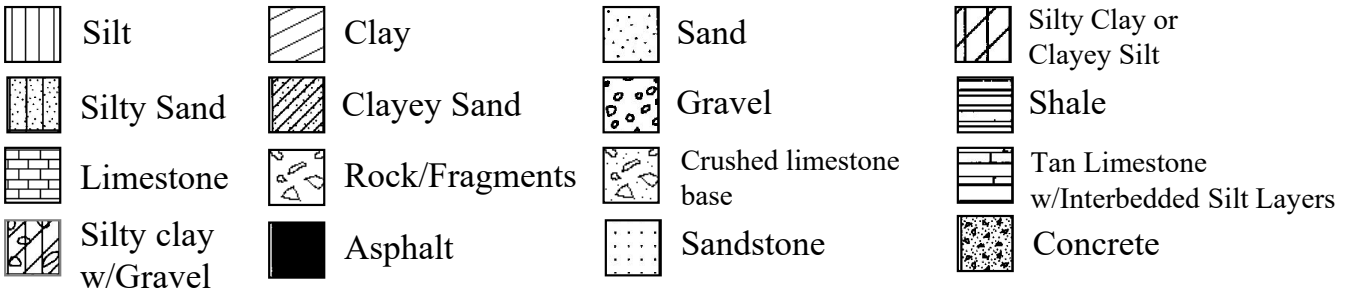
DEPTH (feet)	SOIL DESCRIPTION	BLOWS PER FOOT	UCC STR. (TSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	LIQUID LIMIT(%)	PLASTICITY INDEX	% PASSING #200 SIEVE
	Fill - Unclassified brown & tan very silty clay, w/ multiple small to medium sized limestone rocks							
	CLAYEY SAND (SC), reddish-brown, medium dense	11						
5	CLAYEY SAND (SC), reddish-brown & tan, fine, medium dense	40						
		40		8.7		30	14	30.2
10	CLAYEY SAND (SC), tan, fine, dense							
		50						
15	CLAYEY SAND (SC), reddish-brown, w/ thin medium hard cemented sand layers, medium dense							
		50/12"						
20								
		50/12"		8.6		36	19	39.9
25	Terminated @ 25 feet							
30								

LOG OF BORING 01-00323 - BURNET CITY HALL - 303 EAST JACKSON STREET - BURNET, TEXAS.GPJ HOLT ENGINEERING.GDT 1/26/23

Holt Engineering Inc.
TBPE Firm Registration No. F-430

BORING LOGS – TERMS & SYMBOLS

SOIL TYPES



SAMPLER TYPES

PARTICLE SIZE (ASTM D2487)

Boulders	>12 in.	Coarse Sand	5 mm – 2 mm	Silt	0.075 mm – 0.005 mm
Cobbles	12 in. – 3 in.	Medium Sand	2 mm – 0.4 mm	Clay	< 0.005 mm
Gravel	3 in. – 5 mm	Fine Sand	0.4 mm – 0.075 mm		

STRENGTH OF COHESIVE SOILS

CONSISTENCY	COMPRESSIVE STRENGTH (TSF)
Very Soft	< 0.25
Soft	0.25 to 0.50
Firm	0.50 to 1.0
Stiff	1.0 to 2.0
Very Stiff	2.0 to 4.0
Hard	> 4.0

DENSITY OF GRANULAR SOILS

NUMBER OF BLOWS PER FT., N	RELATIVE DENSITY
0 – 4	Very Loose
4 – 10	Loose
10 – 30	Medium Dense
30 – 50	Dense
Over 50	Very Dense

Structure Description (ASTM D2488)

Stratified	Alternating layers of varying material or color with layers at least 6 mm thick
Laminated	Alternating layers of varying material or color with the layers less than 6 mm thick
Fissured	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided	Fracture planes appear polished or glossy, sometimes striated
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay
Homogeneous	Same color and appearance throughout

Percentages of Sand & Gravel (ASTM D2488)

Trace	< 5%
Few	5% to 10%
Little	15% to 25%
Some	30% to 45%
Mostly	50% to 100%

Criteria for Describing Moisture Conditions (ASTM D2488)

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

HOLT ENGINEERING, INC.
2220 Barton Skyway ■ Austin, Texas 78704 ■ Ph. (512) 447-8166 ■ Fax (512) 447-0852

APPENDIX

ITEM 4

Burnet City Hall

303 E Jackson St, Burnet, TX 78611, USA

Latitude, Longitude: 30.756854, -98.22460889999999

Date	1/24/2023, 8:53:44 AM
Design Code Reference Document	IBC-2015
Risk Category	III
Site Class	D - Stiff Soil

Type	Value	Description
S_S	0.058	MCE_R ground motion. (for 0.2 second period)
S_1	0.033	MCE_R ground motion. (for 1.0s period)
S_{MS}	0.093	Site-modified spectral acceleration value
S_{M1}	0.079	Site-modified spectral acceleration value
S_{DS}	0.062	Numeric seismic design value at 0.2 second SA
S_{D1}	0.053	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	A	Seismic design category
F_a	1.6	Site amplification factor at 0.2 second
F_v	2.4	Site amplification factor at 1.0 second
PGA	0.027	MCE_G peak ground acceleration
F_{PGA}	1.6	Site amplification factor at PGA
PGA_M	0.043	Site modified peak ground acceleration
T_L	12	Long-period transition period in seconds
SsRT	0.058	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	0.066	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.033	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.038	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.6	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.027	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration

Type	Value	Description
C_{RS}	0.887	Mapped value of the risk coefficient at short periods
C_{R1}	0.862	Mapped value of the risk coefficient at a period of 1 s
C_V		Vertical coefficient

DISCLAIMER

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SECTION 01 11 00 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Work covered by the Contract Documents.
   2. Work under other contracts.
   3. Use of premises.
   4. Owner's occupancy requirements.
   5. Specification formats and conventions.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: **Burnet City Hall**

   1. Project Location: 301 East Jackson Street
      Burnet, TX. 78611

B. Owner: City of Burnet

C. Architect: Contract Documents were prepared for the project by Seaux-Pierce Architecture, 1014 Sailmaster Street, Austin, TX 78734.

D. The work consists of the following:

   This project involves construction of a new building of approximately 16,709 sf. Sitework will include new the off-street parking and plaza at the corner of East Jackson and Vanderveer.

E. Project will be constructed under a single prime contract: A101-2017 Standard Form of Agreement Between Owner and Constructor where the basis of payment is a Stipulated Sum.

1.3 EXISTING CONDITIONS

A. Existing conditions may vary from those shown on the drawings. The Contractor shall examine the site and all conditions affecting the work prior to submitting a Bid. No claim for additional cost or time will be accepted for work related to variations in existing conditions, which can be determined by examination.

1.4 WORK UNDER OTHER CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.

B. Concurrent Work: Owner reserves the right to award separate contract(s) for other construction operations at Project site. Those operations may be conducted simultaneously with work under this Contract.

1.5 CONTRACTOR'S USE OF PREMISES

A. General: Contractor shall have limited use of premises for construction operations as required by the Owner and the Architect.

B. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Confine operations to areas within limits indicated and as acceptable to Owner. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.
2. Keep driveways and entrances serving occupied premises clear and open at all times.
   a. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
3. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

1.6 OWNER-FURNISHED EQUIPMENT

A. The Owner will furnish selected equipment as indicated on the drawings and in schedules.

B. The Contractor shall schedule delivery dates and shall be responsible for receiving, unloading, inspecting, handling, installing, and connecting all Owner-furnished items, including support systems such as piping, mechanical and electrical connections.

1. The Owner will arrange for and deliver necessary shop drawings, product data, and samples to the Contractor.
2. The Owner will arrange and pay for delivery of Owner-furnished items. The Contractor shall be responsible to inspect items delivered for damage.
3. If Owner-furnished items are damaged, defective, or missing, the Owner will arrange for replacement.
4. The Owner will arrange for manufacturer's field services and for the delivery of manufacturer's warranties to the appropriate Contractor.
5. The Contractor shall designate delivery dates of Owner-furnished items in the Contractor's Construction Schedule.
6. The Contractor is responsible for receiving, unloading, handling, installing and connecting Owner-furnished items, unless otherwise indicated.
7. The Contractor is responsible for protecting Owner-furnished items from damage, including damage from exposure to the elements. The Contractor shall repair or replace items damaged as a result of his operations.

1.7 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using CSI's "Master Format 04" 50-division format and CSI/CSC's "MasterFormat" numbering system.

1. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.

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

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

    a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 26 00

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections:
   1. Section 01 60 00 – Materials and Equipment for administrative procedures for handling requests for substitutions made after Contract award.

1.2 MINOR CHANGES IN THE WORK

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

1.3 PROPOSAL REQUESTS

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

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

5. Comply with requirements in Section 01 60 00 – Product and Material Requirements if the proposed change requires substitution of one product or system for product or system specified.

C. Proposal Request Form: AIA Document G709.

1.4 CHANGE ORDER PROCEDURES

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

1.5 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
   1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
   1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 26 13

CONTRACTOR'S REQUEST FOR INFORMATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Administrative requirements for Request for Information.

1.2 DEFINITIONS

A. Request for Information: A document submitted by the Contractor requesting information or clarification of a portion of the Contract Documents that is required to properly perform the work, hereinafter referred to as an RFI.
   1. Request shall clearly and concisely set forth the issue for which clarification or interpretation is sought and why a response is needed from the Architect. In the RFI form the Contractor shall set forth their own interpretation or understanding of the requirement along with reasons why they have reached such an understanding. The Architect will review all RFIs to determine whether the RFI is within the meaning of this term.

B. Proper RFIs:
   1. A properly prepared Request for Information shall include a detailed written statement that indicates the specific drawing or specification section in need of clarification and the nature of the clarification requested.
      a. Drawing(s) shall be identified by drawing number and location on the drawing sheet.
      b. Specification shall be identified by section number, page and paragraph.

C. Improper RFIs:
   1. RFIs that are not properly prepared and may be processed by the Architect at the Architect's standard hourly rate and the Architect may charge the Owner. Such costs will be deducted from monies still due the Contractor. The Contractor will be notified by the Architect prior to the processing of improper RFIs.

D. Frivolous RFIs:
   1. Frivolous RFIs are RFIs that request information that is clearly shown on the Contract Documents.
   2. Frivolous RFIs may be returned unanswered or may be processed by the Architect at the Architect's standard hourly rate and the Architect may charge the Owner. Such costs will be deducted from monies still due the Contractor. The Contractor will be notified by the Architect prior to the processing of frivolous RFIs.

1.3 REQUESTS FOR INFORMATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
   1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
   2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
   3. Contractor to limit frivolous RFIs to be billed by the Architect on an hourly basis of $185 per hour.

B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
   1. Project name.
   2. Date.
   3. Name of Contractor.
   4. Name of Architect.
   5. RFI number, numbered sequentially.
   6. Specification Section number and title and related paragraphs, as appropriate.
   7. Drawing number and detail references, as appropriate.
   8. Field dimensions and conditions, as appropriate.
   9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
   10. Contractor's signature.
   11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
      a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

C. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.
   Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow five working days for Architect's response for each RFI, unless review is required by multiple consultants, then the review and response period shall be an average of 10 working days,. RFIs received after 1:00 p.m. will be considered as received the following working day.
   1. The following RFIs will be returned without action:
      a. Requests for approval of submittals.
      b. Requests for approval of substitutions.
      c. Requests for coordination information already indicated in the Contract Documents.
      d. Requests for adjustments in the Contract Time or the Contract Sum.
      e. Requests for interpretation of Architect's actions on submittals.
      f. Incomplete RFIs or RFIs with numerous errors.
   2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
   3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
      a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Software log with not less than the following:
   1. Project name.
   2. Name and address of Contractor.
   3. Name and address of Architect.
   4. RFI number including RFIs that were dropped and not submitted.
   5. RFI description.

6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.4 ARCHITECT'S RESPONSE TO RFIs

A. Contractor shall allow 5 days for the Architect's review and response time for RFIs, after receipt at Architects office, unless review is required by multiple consultants, then the review and response period shall be 7 working days, however, the Architect will endeavor to respond in less time. If additional time is required beyond the 5 days allowed, the Architect shall notify the Owner and Contractor in writing.
   1. RFI shall state requested date/time for response, however, this requested date/time for response is not a guarantee that the RFI will be answered by that date/time if that date/time is too expeditious.
   2. RFI's received after 1:00 pm will be considered as received the following working day.

B. Architect will respond to properly prepared RFIs on one of the following forms:
   1. Directly upon the RFI Form
   2. Notice of Clarification (NOC)
   3. Request for Proposal form.

C. Improper or frivolous RFIs shall be subject to one of the following:
   1. A Notification of Processing Fee(s).
   2. Unanswered and returned with the notation: Not Reviewed.

D. The Architect may opt to retain RFIs for discussion during regularly scheduled project meetings for inclusion of responses in meeting minutes in lieu of responding in written form.

E. Responses from the Architect will not change any requirement of the Contract Documents unless so noted by the Architect in the response to the RFI. In the event the Contractor believes that a response to a RFI will cause a change to the requirements of the Contract Documents, the Contractor shall immediately give written notice to the Architect stating that the Contractor considers the response to be a Change Order. Failure to give written notice within 14 days shall waive the Contractor's right to seek additional time or cost.
   1. Answered RFIs shall not be construed as approval to perform extra work.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

Not Used

END OF SECTION

SEAUX-PIERCE ARCHITECTS, L.LC.

Date:

REQUEST FOR INFORMATION

To: **RFI Number:**
Attention: **Contract Number:**
From: **Subject:**

Project Name: **Project Number:**

This is a field clarification to resolve questions and/or conflicts in the plans and specifications. Any change to the contract, as a result of the response to the question below, will be addressed under separate cover.

This **RFI Response** clarifies a question from the General Contractor regarding the Design Intent of the Contract Documents with no anticipated material affect on CONTRACT SUM or TIME. However, if Contract Sum or Time is affected, contact Architect's Office immediately for further instructions and disposition of the following directive.

REFERENCE:

Drawing sheet or spec. section number: _____

Location in field: _____

Response requested not later than: __/__/____
Date

DESCRIPTION:

Clarification Request: _____

_____

Contractor's Proposed Response/Solution: _____

_____
_____
_____
_____
_____
_____

Response to Clarification Request: _____

_____
_____
_____
_____
_____
_____
_____

Project Architect or Engineer: __/__/____
Date ***Signed*** ***Print Name***

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
   1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including Submittals Schedule and Application for Payment forms with Continuation Sheets (AIA Document G703 Continuation Sheet).
   2. Submit the Schedule of Values to Architect at earliest possible date but no later than 7 days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Indicate the scheduled value of major categories and subcontracts for the Work.
   1. Identification: Include the following Project identification on the Schedule of Values:
      a. Project name and location.
      b. Name of Architect.
      c. Owner's project number.
      d. Contractor's name and address.
      e. Date of submittal.
   2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
      a. Related Specification Section or Division.
      b. Description of the Work.
      c. Change Orders (numbers) that affect value.
      d. Dollar value: Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
   3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide several line items for principal subcontract amounts, where appropriate.
   4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
   5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
   6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
   7. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
      a. Identify temporary facilities and other major cost items that are not direct cost of actual work-in-place as either separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
   8. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.3 APPLICATIONS FOR PAYMENT

A. General:
   1. Each Application for Payment shall be consistent with previous applications, except as otherwise required herein, and payments as certified by Architect and paid for by Owner.
   2. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor, or, if not indicated, the 15th day of each month. The period covered by each Application for Payment starts on the day following the end of the preceding period and ends 15 days before the date for each progress payment.
   3. Payment Application Forms: AIA Document G702 and AIA Document G703 Continuation Sheets.
   4. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
      a. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
      b. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

B. Transmittal: Submit 4 signed and notarized original copies of each Application for Payment to Architect. All copies shall include waivers of lien and similar attachments if required.
   1. Transmit with a transmittal form listing attachments and recording appropriate information about application.

C. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
   1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
   2. When an application shows completion of an item, submit final or full waivers.
   3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
   4. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.

D. Initial Application for Payment: Include the following administrative actions and submittals prior to, or with, submittal of first Application for Payment:
   1. List of subcontractors.
   2. Schedule of Values.
   3. Contractor's Construction Schedule (preliminary if not final).
   4. Submittals Schedule (preliminary if not final).
   5. List of Contractor's staff assignments.
   6. Copies of building permits.
   7. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
   8. Certificates of insurance and insurance policies.
   9. Performance and payment bonds.
   10. Data needed to acquire Owner's insurance.

E. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
   1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
   2. Application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

F. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, the following:
   1. Evidence of completion of Project closeout requirements.
   2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
   3. Updated final statement, accounting for final changes to the Contract Sum.
   4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
   5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
   6. AIA Document G707, "Consent of Surety to Final Payment."
   7. Evidence that claims have been settled.
   8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

1. Refer to "A101-2017 Standard Form of Agreement Between Owner and Construction Contractor where the basis of payment is a Stipulated Sum" for Payment Procedures.

END OF SECTION

SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General project coordination procedures.
   2. Conservation.
   3. Coordination Drawings.
   4. Administrative and supervisory personnel.
   5. Project meetings.

1.2 COORDINATION

A. Coordination: Coordinate construction operations to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations that depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
   1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
   1. Preparation of Contractor's Construction Schedule.
   2. Preparation of the Schedule of Values.
   3. Installation and removal of temporary facilities and controls.
   4. Delivery and processing of submittals.
   5. Progress meetings.
   6. Preinstallation conferences.
   7. Project closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
   1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work.

1.3 SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
   1. Indicate relationship of components shown on separate Shop Drawings.
   2. Indicate required installation sequences.
   3. Refer to Division 15 Section "Basic Mechanical Materials and Methods" and Division 16 Section "Basic Electrical Materials and Methods" for specific Coordination Drawing requirements for mechanical and electrical installations.

B. Staff Names: Within 15 days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including emergency contact numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
   1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone.

1.4 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
   1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
   2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
   3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within 3 days of the meeting.

B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
   1. Attendees:
      a. Authorized representatives of Owner
      b. Construction Manager
      c. Architect, and their consultants
      d. Contractor and its superintendent
      e. Major subcontractors; manufacturers; suppliers; and other concerned parties.
      f. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   2. Agenda: Discuss items of significance that could affect progress, including, but not limited to, the following:
      a. Tentative construction schedule.
      b. Phasing.
      c. Critical work sequencing.
      d. Designation of responsible personnel.
      e. Procedures for processing field decisions and Change Orders.
      f. Procedures for processing Applications for Payment.
      g. Distribution of the Contract Documents.
      h. Submittal procedures.
      i. Preparation of Record Documents.
      j. Use of the premises.
      k. Responsibility for temporary facilities and controls.

l. Parking availability.
m. Office, work, and storage areas.
n. Equipment deliveries and priorities.
o. First aid.
p. Security.
q. Progress cleaning.
r. Working hours.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees:
a. Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting.
b. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including, but not limited to, requirements for the following:
a. Contract Documents.
b. Options.
c. Related Change Orders.
d. Purchases.
e. Deliveries.
f. Submittals.
g. Review of mockups.
h. Possible conflicts.
i. Compatibility problems.
j. Time schedules.
k. Weather limitations.
l. Manufacturer's written recommendations.
m. Warranty requirements.
n. Compatibility of materials.
o. Acceptability of substrates.
p. Temporary facilities and controls.
q. Space and access limitations.
r. Regulations of authorities having jurisdiction.
s. Testing and inspecting requirements.
t. Required performance results.
u. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements.
4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Pre-Progress Meeting: If requested by Architect, conduct a pre-progress meeting prior to Progress Meeting.
1. Attendees: Owner, Architect, Contractor.

E. Progress Meetings: Conduct progress meetings at regular intervals. Coordinate dates of meetings with preparation of payment requests.
1. Attendees:
a. Representatives of Owner
b. Architect
c. Each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings.

d. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
   b. Review present and future needs of each entity present, including, but not limited to the following:
      1) Interface requirements.
      2) Sequence of operations.
      3) Status of submittals.
      4) Deliveries.
      5) Off-site fabrication.
      6) Access.
      7) Site utilization.
      8) Temporary facilities and controls.
      9) Work hours.
      10) Hazards and risks.
      11) Progress cleaning.
      12) Quality and work standards.
      13) Change Orders.
      14) Documentation of information for payment requests.
3. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
   a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

F. Coordination Meetings: Conduct Project coordination meetings at weekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees:
   a. Representatives of Owner
   b. Each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings.
   c. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
   a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Combined Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

b. Schedule Updating: Revise Combined Contractor's Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.

c. Review present and future needs of each contractor present, including, but not limited to, the following:
   1) Interface requirements.
   2) Sequence of operations.
   3) Status of submittals.
   4) Deliveries.
   5) Off-site fabrication.
   6) Access.
   7) Site utilization.
   8) Temporary facilities and controls.
   9) Work hours.
   10) Hazards and risks.
   11) Progress cleaning.
   12) Quality and work standards.
   13) Change Orders.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 32 26

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Contractor's Construction Schedule.
   2. Submittals Schedule.
   3. Daily construction reports.
   4. Field condition reports.
   5. Construction photographs.

1.2 DEFINITIONS

A. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.

B. Float: The measure of leeway in starting and completing an activity.
   1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.

C. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

D. Major Area: A story of construction, a separate building, or a similar significant construction element.

1.3 SUBMITTALS

A. Submittals Schedule:
   1. Arrange the following information in a tabular format:
      a. Scheduled date for first submittal.
      b. Specification Section number and title.
      c. Submittal category (action or informational).
      d. Name of subcontractor.
      e. Description of the Work covered.
      f. Scheduled date for Architect's final release or approval.
   2. Submit 3 copies of schedule.
   3. If requested by Architect, provide electronic copy for Architect’s use.

B. Preliminary Network Diagram: Submit 2 printed copies:
   1. First copy: Single sheet of reproducible media.
   2. Second copy: Print, large enough to show entire network for entire construction period.

C. Contractor's Construction Schedule: Submit 2 printed copies of initial schedule.
   1. First copy: Reproducible media.
   2. Second copy: Blue or black-line print, large enough to show entire schedule for entire construction period.

D. CPM Reports: Concurrent with CPM schedule, submit 3 printed copies of each of the following computer-generated reports. Each activity identified in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float.
   1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
   2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
   3. Total Float Report: List of all activities sorted in ascending order of total float.

E. Construction Photographs: Submit 2 prints of each photographic view within 7 days of taking photographs.

F. Daily Construction Reports: Submit 2 copies at weekly intervals.

G. Field Condition Reports: Submit 2 copies at time of discovery of differing conditions.

1.4 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

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

C. Coordinate access to Project site with photographer and provide auxiliary services requested, including use of temporary facilities including temporary lighting.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
   1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
   2. Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONSTRUCTION SCHEDULE

A. General: Submit Contractor's Construction Schedule within 10 calendar days of date established for the Notice to Proceed. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project. Submit updated schedule with each application for payment.

B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Indicated separate activities, broken down by trade or material, including the following information:
   1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
   2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
   3. Submittal Review Time: Include review and resubmittal time frames as indicated in Section 01 33 00 – Submittal Procedures. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
   4. Startup and Testing Time: Include time frame recommended by product and system manufacturers for startup and testing.
   5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.

D. Contract Modifications: Submit a revised schedule with each proposed contract modification, demonstrating the effect of the proposed change on the overall project schedule.
   1. Format: Schedule may be by CPM or bar graph (Gantt chart) type.
   2. Gantt: Comprehensive, fully developed, horizontal Gantt-chart-type indicating each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
      a. For construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.
   3. CPM: Prepare Contractor's Construction Schedule using a CPM network analysis diagram.
      a. Preliminary Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
      b. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for the Notice to Proceed.
      c. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
      d. Unit of Time: One workday.
      e. Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.
      f. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following:
         1) Preparation and processing of submittals.
         2) Purchase of materials.
         3) Delivery.
         4) Fabrication.
         5) Installation.

g. Processing: Process data to produce output data or a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
h. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
i. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
1) Contractor or subcontractor and the Work or activity.
2) Description of activity.
3) Principal events of activity.
4) Immediate preceding and succeeding activities.
5) Early and late start dates.
6) Early and late finish dates.
7) Activity duration in workdays.
8) Total float or slack time.
9) Average size of workforce.

E. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to the following:
a. Changes in early and late start dates.
b. Changes in early and late finish dates.
c. Changes in activity durations in workdays.
d. Changes in the critical path.
e. Changes in total float or slack time.
f. Changes in the Contract Time.
3. As the Work progresses, indicate Actual Completion percentage for each activity.

F. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

2.3 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording events at Project site, including the following:
1. List of subcontractors and numbers of associated workers with each trade.
2. High and low temperatures and general weather conditions.
3. Accidents.
4. Stoppages, delays, shortages, and losses.
5. Meter readings and similar recordings.
6. Orders and requests of authorities having jurisdiction.
7. Services connected and disconnected.
8. Equipment or system tests and startups.

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.4 CONSTRUCTION PHOTOGRAPHS

A. Photographer: Engage a qualified photographer to take construction photographs.

B. Photographic Film: Medium-format, 2-1/4 by 2-3/4 inches..
   1. Prints: 8-by-10-inch smooth-surface matte prints on single-weight commercial-grade stock, enclosed back to back in clear plastic sleeves that are punched for standard 3-ring binder.
   2. Negatives: Submit a complete set of photographic negatives in protective envelopes with each submittal of prints. Identify date photographs were taken.

C. Digital Photographs:
   1. Resolution: Minimum 2 megapixel resolution.
   2. Prints: Minimum 4 inches x 5 inches printed on photographic paper specifically intended for prints of digital photographs.
   3. CD-Rom: Submit a CD-Rom containing photographs in JPEG format, with an index, as part of closeout documents

D. Identification: On back of each print, or the front of each CD-Rom, provide an applied label or rubber-stamped impression with the following:
   1. Name of Project.
   2. Name and address of photographer.
   3. Name of Architect.
   4. Name of Contractor.
   5. Date photograph was taken.
   6. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

E. Date Stamp: Date and time stamp each photograph as it is being taken so stamp is integral to photograph.

F. Pre-construction Photographs: Take sufficient photographs prior to commencing work to indicate existing conditions, including, but not limited to, landscape, buildings, site features and furnishings.

G. Periodic Construction Photographs: Take 4 color photographs monthly, coinciding with cutoff date associated with each Application for Payment. Photographer shall select vantage points to best show status of construction and progress since last photographs were taken.
   1. Field Office Prints: Retain one set of prints of periodic photographs in field office at Project site, available at all times for reference. Identify photographs the same as for those submitted to Architect.

PART 3 - EXECUTION

Not used

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's approval. Submittals may be rejected for not complying with requirements.

1.3 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
      a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Submittals Schedule: Comply with requirements in Section 01 32 26 - Construction Progress Documentation for list of submittals and time requirements for scheduled performance of related construction activities.

C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal.
   1. Initial Review: Allow 15 calendar days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
   2. If intermediate submittal is necessary, process it in same manner as initial submittal.
   3. Allow 15 calendar days for processing each resubmittal.
   4. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.

D. Identification: Place a permanent label or title block on each submittal for identification.
   1. Indicate name of firm or entity that prepared each submittal on label or title block.
   2. Provide a space beside the title block to record Contractor's review and approval markings and action taken by Architect.
   3. Sequentially number the transmittal forms. Resubmittals shall have the original number with an alphabetical suffix
   4. Include the following information on label for processing and recording action taken:
      a. Project name.
      b. Date.
      c. Name and address of Architect.

d. Name and address of Contractor.
e. Name and address of subcontractor.
f. Name and address of supplier.
g. Name of manufacturer.
h. Unique identifier, including revision number.
i. Number and title of appropriate Specification Section.
j. Drawing number and detail references, as appropriate.
k. Other necessary identification.

E. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.

F. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.

G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review or will discard submittals received from sources other than Contractor.
1. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
2. Transmittal Form: Use AIA Document G810.

H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, and installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

I. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.
1. Number of Copies: Submit 5 copies of each submittal, unless otherwise indicated. Architect will return 3 copies. Mark up and retain one returned copy as a Project Record Document.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
a. Manufacturer's written recommendations.
b. Manufacturer's product specifications.
c. Manufacturer's installation instructions.
d. Manufacturer's catalog cuts.
e. Wiring diagrams showing factory-installed wiring.
f. Printed performance curves.
g. Operational range diagrams.
h. Compliance with recognized trade association standards.
i. Compliance with recognized testing agency standards.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
   1. Preparation: Include the following information, as applicable:
      a. Dimensions.
      b. Identification of products.
      c. Fabrication and installation drawings.
      d. Roughing-in and setting diagrams.
      e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
      f. Shopwork manufacturing instructions.
      g. Templates and patterns.
      h. Schedules.
      i. Notation of coordination requirements.
      j. Notation of dimensions established by field measurement.
   2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
   3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.

D. Coordination Drawings: As specified in Section 01 31 00 - Project Management and Coordination.

E. Samples: Prepare physical units of materials or products, including the following:
   1. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
      a. Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
   2. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
   3. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Architect's sample where so indicated. Attach label on unexposed side.
   4. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
   5. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

F. Product Schedule or List: Prepare a written summary indicating types of products required for the Work and their intended location.

G. Submittals Schedule: As specified in Section 01 32 26 – Construction Progress Documentation.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.
   1. Number of Copies: Submit 2 copies of each submittal, unless otherwise indicated. Architect will not return copies.

2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
3. Test and Inspection Reports: Comply with requirements in Section 01 40 00 –Quality Requirements.

B. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

C. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.

D. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

E. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.

F. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.

G. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.

H. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.

I. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

J. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.

K. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

L. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

M. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Section 01 77 00 – Contract Closeout.

N. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

O. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer.

P. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections.

Q. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

R. Construction Photographs: Comply with requirements in Section 01 32 26 – Construction Progress Documentation.

S. Elongation Reports: Prepare schedule indicating tendon elongation and plan with corresponding tendon numbers for post tensioning.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

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

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken.

C. Informational Submittals: Architect will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

E. Submittals will be rejected that are sent to any consultant directly. All submittals shall be routed through the Architect.

END OF SECTION

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
   2. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.2 SUBMITTALS

A. Qualification Data: Include proof of qualifications for testing agencies in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Reports: Prepare and submit certified written reports that include the following:
   1. Date of issue.
   2. Project title and number.
   3. Name, address, and telephone number of testing agency.
   4. Dates and locations of samples and tests or inspections.
   5. Names of individuals making tests and inspections.
   6. Description of the Work and test and inspection method.
   7. Identification of product and Specification Section.
   8. Complete test or inspection data.
   9. Test and inspection results and an interpretation of test results.
   10. Ambient conditions at time of sample taking and testing and inspecting.
   11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
   12. Name and signature of laboratory inspector.
   13. Recommendations on retesting and reinspecting.

C. Permits, Licenses, and Certificates: Submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, and notices, receipts for fee payments, judgments, correspondence, records, and similar documents, for Owner’s records.

1.3 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.

1.4 TESTS AND INSPECTIONS

A. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

B. Special Tests and Inspections: Owner will engage a testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner and as indicated on Drawings.
   1. Testing agency will notify Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
   2. Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
   3. Testing agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
   4. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
   5. Testing agency will retest and reinspect corrected work.
   6. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of the types of testing and inspecting they are engaged to perform.
   7. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

C. Contractor Responsibilities:
   1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
      a. Contractor shall not employ the same entity engaged by Owner, unless agreed to in writing by Owner.
   2. Notify testing agencies at least 24hours in advance of time when Work that requires testing or inspecting will be performed.
   3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
   4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
   5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

D. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
   1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
   3. Distribute copies of a certified written report, of each test, inspection, and similar quality-control service as follows:
      a. 2 copies to the Architect
      b. 1 copy to the Structural Engineer
      c. 2 copies to the Contractor
   4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
   5. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
   1. Access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
   4. Facilities for storage and field-curing of test samples.
   5. Delivery of samples to testing agencies.
   6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
   7. Security and protection for samples and for testing and inspecting equipment at Project site.

1.5 QUALITY CONTROL

A. Where Specifications require that a particular product be installed and/or applied by an Applicator approved by the Manufacturer, it is the Contractor's responsibility to ensure that Subcontractor employed for such Work is approved. Such Subcontractor(s) shall provide evidence of being approved when requested by the Architect.
   1. Work shall be executed by mechanics skilled in the Work required. Conform to the methods, standards and accepted practices of the Trade or Trades involved.

B. Each Section includes a list of Manufacturers whose equipment is acceptable as to manufacture, subject to conformance with the Contract Documents. Careful checking must be made by the Contractor and the manufacturer or equipment supplier to verify that the equipment will meet all capacities, requirements, space allocations and is suitable to the intended purpose.

C. Conflicting Requirements: If Contract Documents conflict with manufacturer’s written instructions for minimum installation procedures, assume the more stringent applies and request confirmation from Architect for a decision before proceeding.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. Protect construction exposed by or for quality-control service activities.

B. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01 42 00

REFERENCES AND DEFINITIONS

PART 1 - GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "As necessary" means essential to the completion of the work.

D. "As required" means as required by the contract documents.

E. "As selected", "as approved" or words of similar import mean as selected by, as approved by, or as accepted by the Architect and Owner.

F. "As shown", "as detailed", "as indicated" or words of similar import mean “as indicated on the drawings” unless otherwise noted.

G. "Concealed" means not visible in the finished work.

H. "Days" means calendar days.

I. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."

J. "Exposed" means visible in the finished work.

K. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

L. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

M. "Furnish": Purchase and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

N. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, connecting, and similar operations.

O. "Provide": Furnish and install, complete and ready for the intended use.

P. "Installer": Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

Q. "Experienced": When used with an entity, "experienced" means having successfully completed a minimum of 5 previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

R. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

S. "Shall": Means “mandatory”.

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

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.

C. Conflicting Requirements: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, request clarification from Architect for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

E. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities Available from Access Board www.access-board.gov	 (800) 872-2253 (202) 272-5434

CFR	Code of Federal Regulations Available from Government Printing Office www.access.gpo.gov/nara/cfr	 (888) 293-6498 (202) 512-1530
UFAS	Uniform Federal Accessibility Standards Available from Access Board www.access-board.gov	 (800) 872-2253 (202) 272-5434

1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association, Inc. (The) www.aluminum.org	(202) 862-5100
AAADM	American Association of Automatic Door Manufacturers www.aaadm.com	(216) 241-7333
AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials www.aashto.org	(202) 624-5800
AATCC	American Association of Textile Chemists and Colorists (The) www.aatcc.org	(919) 549-8141
ACI	American Concrete Institute/ACI International www.aci-int.org	(248) 848-3700
ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216
ADC	Air Diffusion Council www.flexibleduct.org	(312) 201-0101
AFPA	American Forest & Paper Association (See AF&PA)	
AF&PA	American Forest & Paper Association www.afandpa.org	(800) 878-8878 (202) 463-2700
AGA	American Gas Association www.aga.org	(202) 824-7000

AGC	Associated General Contractors of America (The) www.agc.org	(703) 548-3118
AHA	American Hardboard Association www.ahardbd.org	(847) 934-8800
AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960
AIA	American Institute of Architects (The) www.aia.org	(202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
AITC	American Institute of Timber Construction www.aitc-glulam.org	(303) 792-9559
ALA	American Laminators Association (See LMA)	
ALCA	Associated Landscape Contractors of America www.alca.org	(800) 395-2522 (703) 736-9666
ALSC	American Lumber Standard Committee	(301) 972-1700
ANLA	American Nursery & Landscape Association (Formerly: AAN - American Association of Nurserymen) www.anla.org	(202) 789-2900
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600
APA	Architectural Precast Association www.archprecast.org	(941) 454-6989
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers www.ashrae.org	(800) 527-4723 (404) 636-8400
ASME	ASME International (The American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (212) 591-7722

ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040
ASTM	American Society for Testing and Materials www.astm.org	(610) 832-9585
AWCI	AWCI International (Association of the Wall and Ceiling Industries International) www.awci.org	(703) 534-8300
AWPA	American Wood-Preservers' Association www.awpa.com	(817) 326-6300
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
BIA	Brick Industry Association (The) www.bia.org	(703) 620-0010
CCC	Carpet Cushion Council www.carpetcushion.org	(203) 637-1312
CCFSS	Center for Cold-Formed Steel Structures www.umr.edu/~ccfss	(573) 341-4471
CDA	Copper Development Association Inc. www.copper.org	(800) 232-3282 (212) 251-7200
CIMA	Cellulose Insulation Manufacturers Association www.cellulose.org	(888) 881-2462 (937) 222-2462
CISCA	Ceilings & Interior Systems Construction Association www.cisca.org	(630) 584-1919
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	(301) 596-2583
CRI	Carpet & Rug Institute (The) www.carpet-rug.com	(800) 882-8846 (706) 278-3176
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200
CSA	CSA International (Formerly: IAS - International Approval Services) www.csa-international.org	(800) 463-6727 (416) 747-4000
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300

DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010
EIMA	EIFS Industry Members Association www.eifsfacts.com	(800) 294-3462 (770) 968-7945
EJMA	Expansion Joint Manufacturers Association, Inc. www.ejma.org	(914) 332-0040
FHAG	Fair Housing Accessibility Guidelines – Available form US Department of Housing and Urban Development www.fairhousingfirst.org	
FGMA	Flat Glass Marketing Association (See GANA)	
FM	Factory Mutual System (See FMG)	
FMG	FM Global (Formerly: FM - Factory Mutual System) www.fmglobal.com	(401) 275-3000
GA	Gypsum Association www.gypsum.org	(202) 289-5440
GANA	Glass Association of North America (Formerly: FGMA - Flat Glass Marketing Association) www.glasswebsite.com/gana	(785) 271-0208
GTA	Glass Tempering Division of Glass Association of North America (See GANA)	
HMMA	Hollow Metal Manufacturers Association (See NAAMM)	
HPVA	Hardwood Plywood & Veneer Association www.hpva.org	(703) 435-2900
ICRI	International Concrete Repair Institute (The) www.icri.org	(703) 450-0116
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.org	(212) 419-7900
IESNA	Illuminating Engineering Society of North America www.iesna.org	(212) 248-5000
IGCC	Insulating Glass Certification Council www.igcc.org	(315) 646-2234
ILI	Indiana Limestone Institute of America, Inc. www.iliai.com	(812) 275-4426

KCMA	Kitchen Cabinet Manufacturers Association www.kcma.org	(703) 264-1690
LGSI	Light Gage Structural Institute www.loseke.com	(972) 370-0967
LMA	Laminating Materials Association (Formerly: ALA - American Laminators Association) www.lma.org	(201) 664-2700
LSGA	Laminated Safety Glass Association (See GANA)	
MBMA	Metal Building Manufacturers Association www.mbma.com	(216) 241-7333
MCA	Metal Construction Association www.metalconstruction.org	(312) 201-0193
MFMA	Maple Flooring Manufacturers Association www.maplefloor.org	(847) 480-9138
MFMA	Metal Framing Manufacturers Association	(312) 644-6610
MIA	Marble Institute of America www.marble-institute.com	(614) 228-6194
ML/SFA	Metal Lath/Steel Framing Association (See SSMA)	
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(312) 332-0405
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NeLMA	Northeastern Lumber Manufacturers' Association www.nelma.org	(207) 829-6901
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NETA	National Electrical Testing Association www.netaworld.org	(303) 697-8441
NFPA	National Fire Protection Association www.nfpa.org	(800) 344-3555 (617) 770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-6372

NGA	National Glass Association www.glass.org	(703) 442-4890
NHLA	National Hardwood Lumber Association www.natlhardwood.org	(800) 933?0318 (901) 377-1818
NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393
NOFMA	National Oak Flooring Manufacturers Association www.nofma.org	(901) 526-5016
NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NSA	National Stone Association www.aggregates.org	(800) 342-1415 (703) 525-8788
NTMA	National Terrazzo and Mosaic Association, Inc. www.ntma.com	(800) 323-9736 (703) 779-1022
NWWDA	National Wood Window and Door Association (See WDMA)	
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
PDCA	Painting and Decorating Contractors of America www.pdca.com	(800) 332-7322 (703) 359-0826
PDI	Plumbing & Drainage Institute www.pdionline.org	(800) 589-8956 (508) 230-3516
RMA	Rubber Manufacturers Association www.rma.org	(800) 220-7620 (202) 682-4800
SDI	Steel Deck Institute www.sdi.org	(847) 462-1930
SDI	Steel Door Institute www.steeldoor.org	(440) 899-0010
SGCC	Safety Glazing Certification Council www.sgcc.org	(315) 646-2234
SIGMA	Sealed Insulating Glass Manufacturers Association www.sigmaonline.org/sigma	(312) 644-6610
SJI	Steel Joist Institute www.steeljoist.org	(843) 626-1995

SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703) 803-2980
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division) www.sprayfoam.org	(800) 523-6154
SPI	The Society of the Plastics Industry www.plasticsindustry.org	(202) 974-5200
SPRI	SPRI (Single Ply Roofing Institute) www.spri.org	(781) 444-0242
SSINA	Specialty Steel Industry of North America www.ssina.com	(800) 982-0355 (202) 342-8630
SSMA	Steel Stud Manufacturers Association (Formerly: ML/SFA - Metal Lath/Steel Framing Association) www.ssma.com	(312) 456-5590
SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(800) 837-8303 (412) 281-2331
SWI	Steel Window Institute www.steelwindows.com	(216) 241-7333
SWRI	Sealant, Waterproofing, and Restoration Institute www.swrionline.org	(816) 472-7974
TCA	Tile Council of America, Inc. www.tileusa.com	(864) 646-8453
UL	Underwriters Laboratories Inc. www.ul.com	(800) 704-4050 (847) 272-8800
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800) 283-1486 (503) 639-0651
WCMA	Window Covering Manufacturers Association (Formerly: AWCMA - American Window Covering Manufacturers Association) www.windowcoverings.org	(800) 506-4653 (212) 661-4261
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association) www.wdma.com	(800) 223-2301 (847) 299-5200
WIC	Woodwork Institute of California www.wicnet.org	(916) 372-9943

WMMPA	Wood Moulding & Millwork Producers Association www.wmmpa.com	(800) 550-7889 (530) 661-9591
WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

BOCA	BOCA International, Inc. www.bocai.org	(708) 799-2300
CABO	Council of American Building Officials (See ICC)	
IAPMO	International Association of Plumbing and Mechanical Officials (The) www.iapmo.org	(909) 595-8449
ICBO	International Conference of Building Officials www.icbo.org	(800) 284-4406 (562) 699-0541
ICC	International Code Council (Formerly: CABO - Council of American Building Officials) www.intlcode.org	(703) 931-4533
SBCCI	Southern Building Code Congress International, Inc. www.sbcci.org	(205) 591-1853

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CE	Army Corps of Engineers www.usace.army.mil	
CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-0990
DOC	Department of Commerce www.doc.gov	(202) 482-2000
EPA	Environmental Protection Agency www.epa.gov	(202) 260-2090
FAA	Federal Aviation Administration www.faa.gov	(202) 366-4000
FCC	Federal Communications Commission www.fcc.gov	(202) 418-0190

FDA	Food and Drug Administration www.fda.gov	(888) 463-6332
GSA	General Services Administration www.gsa.gov	(202) 708-5082
HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478
OSHA	Occupational Safety & Health Administration www.osha.gov	(202) 693-1999
USDA	Department of Agriculture www.usda.gov	(202) 720-2791
USPS	Postal Service www.usps.com	(202) 268-2000

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.

1.2 SUBMITTALS

A. Temporary Utility Reports: Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

1.3 QUALITY ASSURANCE

A. Standards: Comply with ANSI A10.6, NECA's "Temporary Electrical Facilities," and NFPA 241.

B. Comply with codes and regulations regarding potable drinking water, sanitation, dust control, fire protection, and other temporary controls.
   1. Electric Service: Comply with NFPA, NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

C. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.4 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

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

PART 2 - PRODUCTS

2.1 EQUIPMENT, FACILITIES AND CONTROLS

A. General:
   1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
   2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, as approved by Owner.

B. Site Enclosure Fence:
   1. Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch- OD corner and pull posts.
   2. Locate where indicated, or enclose entire Project site or portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering site except by entrance gates.
   3. Provide gates in sizes and at locations necessary to accommodate delivery vehicles and other construction operations. Close and lock after construction hours.

C. Field Offices: Weather-tight, with lockable entrances, operable windows, and serviceable finishes; on foundations adequate for normal loading.
   1. Size: Sufficient to accommodate required office personnel and meetings of 10 persons at Project site.
   2. Furnishings: Desk and four chairs, four-drawer file cabinet, a plan table, a plan rack, and bookcase.
   3. Provide the following:
      a. Electric heater with thermostat capable of maintaining a uniform indoor temperature of 68 deg F.
      b. Air-conditioning unit capable of maintaining an indoor temperature of 72 deg F.
      c. Fluorescent light fixtures capable of maintaining average illumination of 20 fc at desk height. Provide 110- to 120-V duplex outlets spaced at not more than 12-foot intervals, 1 per wall in each room.
   4. Locate temporary offices at location as directed by Architect or Owner.

D. Fire Protection:
   1. Comply with fire insurance and governing regulations.
   2. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.
      a. Provide adequate number of fire extinguishers to protect the Work.
   3. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

E. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction until permanent water service is in use. Sterilize temporary water piping before use.

F. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.
   1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
   2. Toilets: Provide self-contained single occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material. Provide separate facilities for male and female personnel.
   3. Wash Facilities: Install wash facilities supplied with potable water at locations as required for personnel who handle materials that require wash up. Dispose of drainage properly. Supply cleaning compounds appropriate for each type of material handled.

G. Drinking-Water Fixtures: Provide potable water, including paper cup supply.

H. Heating and Cooling: Provide temporary heating and cooling required by construction activities.
   1. Maintain a minimum temperature of 50 deg F in permanently enclosed portions of building for normal construction activities.
   2. Heating Equipment: Provide and pay for heating devices and heat as required to maintain specified conditions for construction operations.
      a. Heating Units: Listed and labeled, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use for type of fuel being consumed.

I. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

J. Electric Service:
   1. Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnecting means, automatic ground-fault interrupters, and main distribution switchgear.
      a. Install electric power service underground, unless overhead service must be used.
      b. Install power distribution wiring overhead and rise vertically where least exposed to damage.
   2. Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.
   3. Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.

K. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.
   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
   2. Provide the following:
      a. One 100-W incandescent lamp per 500 sq. ft., uniformly distributed, for general lighting, or equivalent illumination.
      b. One 100-W incandescent lamp every 50 feet in traffic areas.
      c. One 100-W incandescent lamp per story in stairways and ladder runs, located to illuminate each landing and flight.
   3. Install exterior-yard site lighting that will provide adequate illumination for construction operations, traffic conditions, and signage visibility when the Work is being performed.

L. Telephone Service: Provide temporary telephone service throughout construction period for common-use facilities used by all personnel engaged in construction activities. Install separate telephone line for each field office and first-aid station.
   1. Provide additional telephone lines for the following:
      a. In field office with more than two occupants, install a telephone for each additional occupant or pair of occupants.
      b. Provide a dedicated telephone line for each facsimile machine and computer with modem in each field office.
   2. Provide messaging system on superintendent's telephone.
   3. Furnish superintendent with electronic paging device, portable two-way radio or portable cellular telephone for use when away from field office.

M. Electronic Communication Service: Provide temporary electronic communication service, including electronic mail, in common-use facilities.
   1. Provide high-speed internet access primary field office.

N. Project Identification and Temporary Signs: Prepare Project identification and other signs in sizes indicated. Do not permit installation of unauthorized signs except as required by law.
   1. Contractor to provide at Owner's expense, Project identification signs. Colors, pattern and verbiage shall be as directed by Architect.
   2. Prepare temporary signs to provide directional information to construction personnel and visitors.
   3. Install signs where indicated or as directed by Architect.

O. Storage and Fabrication Sheds: Provide sheds or adequate size to accommodate stored materials and equipment.
   1. Construct framing, sheathing, and siding using fire-retardant-treated lumber and plywood.

P. Temporary Stairs: Provide temporary stairs where ladders are not adequate. Cover finished, permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of acceptance.

Q. Sewers and Drainage: Provide temporary connections to existing sewers to remove effluent that can be discharged lawfully. If sewers are not available, provide drainage ditches, dry wells, stabilization ponds, and similar facilities acceptable by law. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off-site in a lawful manner.
   1. Filter out excessive soil, construction debris, chemicals, oils, and similar contaminants that might clog sewers or pollute waterways before discharge.
   2. Connect temporary sewers to existing system as directed by sewer department officials.
   3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. After heavy use, restore normal conditions promptly.
   4. Provide temporary filter beds, settlement tanks, separators, and similar devices to purify effluent to levels acceptable to authorities having jurisdiction.

R. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate to support loads and to withstand exposure to traffic during construction period. Locate temporary roads and paved areas as indicated on Drawings.
   1. Provide and maintain access to fire hydrants, free of obstructions.
   2. Provide means of removing mud from vehicle wheels before entering streets.
   3. Designated existing on-site roads may be used for construction traffic.
   4. Access roads shall be capable of supporting imposed loads of all emergency vehicles.

S. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste. Comply with Section 01 73 00 - Execution Requirements for progress cleaning requirements.
   1. If required by authorities having jurisdiction, provide separate containers, clearly labeled, for each type of waste material to be deposited.
   2. Develop a waste management plan for Work performed on Project. Indicate types of waste materials Project will produce and estimate quantities of each type. Provide detailed information for on-site waste storage and separation of recyclable materials. Provide information on destination of each type of waste material and means to be used to dispose of all waste materials.

T. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Provide lighting, including flashing red or amber lights as required.

U. Water Control:
   1. Grade site to drain. Maintain excavations free of water. Provide, operate and maintain pumping equipment.
   2. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
   3. Stormwater Control: Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of stormwater from heavy rains.

V. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
   1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
   2. Vertical Openings: Close openings of 25 sq. ft. or less with plywood or similar materials.
   3. Horizontal Openings: Close openings in floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
   4. Install tarpaulins securely using fire-retardant-treated wood framing and other materials.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
   1. Locate facilities where they will serve Project adequately or as directed by Architect.
   2. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

B. Temporary Utilities:
   1. Engage appropriate local utility company to install temporary service.

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

D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from construction damage. Protect tree root systems from damage, flooding, and erosion.

E. Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest-control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Engage this pest-control service to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.

3.2 OPERATION, TERMINATION, AND REMOVAL

A. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by weather.
   1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

B. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion. Permanent fire protection materials may be used, if required.

C. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction and site that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
   1. Materials and facilities that constitute temporary facilities are the property of Contractor. Owner reserves right to take possession of Project identification signs.
   2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in Section 01 77 00 – Closeout Procedures.

END OF SECTION

SECTION 01 60 00

MATERIALS AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

1. Related Documents: Provisions established in General and Supplementary Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.
2. Section Includes:
    1. Administrative and procedural requirements governing the Contractor's selection of products for use in the Project.
    2. Packaging, transportation, delivery, receiving, storage, protection and other product handling requirements.
    3. Product options and substitutions including:
        1) Contractor's options in selection of products.
        2) Products list.
        3) Requests for substitution of products.

1.2 DEFINITIONS

1. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well recognized meanings in the construction industry.
    1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
        1) "Named Products" are items identified by manufacturer's product name, including make or model designation, indicated in the manufacturers published product literature that is current as of the date of the Contract Documents.
    2. "Materials" are products that are substantially shaped; cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
    3. "Equipment", is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.

1.3 PRODUCT LIST

1. Prepare a schedule showing products specified in a tabular form acceptable to the Architect. Include generic names of products required. Include the manufacturer's name and proprietary product names for each item listed.
2. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.
3. Coordinate the product list schedule with the Contractor's Construction Schedule.
4. Form: Prepare the product listing schedule with information on each item tabulated under the following column headings:
    1. Related Specification Section number.
    2. Generic name used in Contract Documents.
    3. Proprietary name, model number and similar designations.
    4. Manufacturer's name and address.
    5. Supplier's name and address.
    6. Installer's name and address.
    7. Projected delivery date, or time span of delivery period.
5. Initial Submittal:
    1. Within 30 days after date of commencement of the Work, submit 3 copies of an initial product list schedule.

2. Provide a written explanation for omissions of data, and for known variations from Contract requirements.
3. At the Contractor's option, the initial submittal may be limited to product selections and designations that must be established early in the Contract period.

6. Completed Schedule:
   1. Within 60 days after date of commencement of the Work, submit 3 copies of the completed product list schedule.
   2. Provide a written explanation for omissions of data, and for known variations from Contract requirements.
7. Architect's Action:
   1. Architect will respond in writing to the Contractor within 2 weeks of receipt of the completed product list schedule.
   2. No response within this time period constitutes no objection to listed manufacturers or products, but does not constitute a waiver of the requirement that products comply with Contract Documents.
   3. The Architect's response will include the following:
      1) A list of unacceptable product selections, containing a brief explanation of reasons for this action.

1.4 QUALITY ASSURANCE

1. Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.
   1. When specified products are available only from sources that do not or cannot produce a quantity adequate to complete project requirements in a timely manner, consult with the Architect for a determination of the most important product qualities before proceeding. Qualities may include attributes relating to visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources that product products that possess these qualities, to the fullest extent possible.
2. Compatibility of Options: When the Contractor is given the option of selecting between two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.
3. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturers or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view in occupied spaces or on the exterior.
   1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is not conspicuous.
   2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface which is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:
      1) Name of product and manufacturer.
      2) Model and serial number.
      3) Capacity.
      4) Speed.
      5) Ratings.
4. Matching of Colors:
   1. When a product is listed in the specifications with an accompanying color, pattern, texture, or sheen, provide only that product, or one that is identical in color, pattern, texture, and sheen to the product specified, regardless if the color, pattern, texture, or sheen of the alternate manufacturer's product is a standard or option.
   2. On finished materials and products, verify that colors, patterns, textures, and sheens are identical for the entire project and that there are no visual differences between batches, packages, bundles, or shipments, due to differing production runs. Architect reserves the right to reject products and materials installed, which have, in the sole opinion of the Architect, a significant enough difference in color, pattern, texture, or sheen, from other products on the project, so as to be visually distracting.

1.5 OPTIONS

1. Products Specified by Reference Standards or by Description Only: Any product meeting those standards.
2. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not specifically named within time frame specified herein.
3. Products Specified by Naming Several Manufacturers: Products of named manufacturers meeting specifications; or approved equal.
4. Products Specified by Naming Only One Manufacturer: No option; no substitution allowed.

1.6 SUBSTITUTIONS

1. Limitations:
    1. Requests for substitutions of products will be considered only within 30 days after date of award of contract. Subsequent requests will be considered only in case of product unavailability or other conditions beyond control of Contractor.
    2. Substitutions will not be considered:
        1) When indicated on shop drawings or product data submittal without separate formal request.
        2) When requested directly by subcontractor or supplier.
        3) When acceptance will require substantial revision of Contract Documents.
    3. Do not order or install proposed substitute products without written acceptance.
    4. Only one request for substitution for each product will be considered. When substitution is not accepted, provide specified product.
    5. Architect will determine acceptability of substitutions.
2. Requests for Substitutions:
    1. Submit separate request for each substitution. Document each request with complete data substantiating compliance of proposed substitution with requirements of Contract Documents. Utilize substitution request form attached.
    2. Identify product by Specifications section and Article numbers. Provide manufacturer's name and address, trade name of product, and model or catalog number. List fabricators and suppliers as appropriate.
    3. Attach product data as specified in Section 01 33 00.
    4. List similar projects using product, dates of installation, and names of Architect and Owner.
    5. Give itemized comparison of proposed substitution with specified product, listing variations, and reference to Specifications section and Article numbers.
    6. Give quality and performance comparison between proposed substitution and the specified product.
    7. Give cost data comparing proposed substitution with specified product, and amount of net change to Contract Sum.
    8. List availability of maintenance services and replacement materials.
    9. State effect of substitution on construction schedule, and changes required in other work or products.
3. Contractor Representation:
    1. Request for substitution constitutes a representation that Contractor has investigated proposed product and has determined that it is equal to or superior in all respects to specified product or that the cost reduction offered, if any, is ample justification for accepting the offered substitution.
    2. Provide same warranty for substitution as for specified product.
    3. Coordinate installation of accepted substitute, making such changes as may be required for Work to be complete in all respects.
    4. Certifies that cost data presented is complete and includes related costs under this Contract.
    5. Waives claims for additional costs related to substitution which may later become apparent.
4. Submittal Procedures:
    1. Submit 3 copies of request for substitution. Use attached form.

2. Architect will review Contractor's requests for substitutions with reasonable promptness.
3. During the bidding period, Architect will record acceptable substitutions in Addenda.
4. After award of Contract, Architect will notify Contractor, in writing, of decision to accept or reject requested substitution, generally within 14 days.
5. For accepted products, submit shop drawings, product data, and samples under provisions of Section 01 33 00.

PART 2 PRODUCTS

2.1 PRODUCT SELECTION

1. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, unused at the time of installation.
    1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
    2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
2. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations, not by previous Project experience. Procedures governing product selection include the following:
    1. Proprietary Specification Requirements: Where only a single product or manufacturer is named, provide the product indicated. No substitutions will be permitted.
    2. Semi-Proprietary Specification Requirements: Where two or more products or manufacturers are named, provide one of the products indicated. No substitutions will be permitted.
        1) Where products or manufacturers are specified by name, comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
    3. Non-Proprietary Specifications: When the Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
    4. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
    5. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated. General overall performance of a product is implied where the product is specified for a specific application.
        1) Manufacturer's recommendations may be contained in published product literature, or by the manufacturer's certification of performance.
    6. Compliance with Standards, Codes and Regulations: Where the Specifications only require compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes or regulations specified.
    7. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.
        1) Where no product available within the specified category matches satisfactorily and also complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category, or for noncompliance with specified requirements.

8. Visual Selection: Where specified product requirements include the phrase "...as selected from manufacturer's standard colors, patterns, textures..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern and texture from the product line selected.

PART 3 EXECUTION

3.1 PACKAGING AND TRANSPORTATION

1. Require supplier to package products in boxes or crates for protection during shipment, handling, and storage. Protect sensitive products against exposure to elements and moisture.
2. Protect sensitive equipment and finishes against impact, abrasion, and other damage.

3.2 DELIVERY, RECEIVING, AND HANDLING

1. Deliver, receive, and handle products in accordance with the manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft
2. Delivery:
    1. Arrange deliveries of products in accordance with construction progress schedules. Allow time for inspection prior to installation.
    2. Coordinate deliveries to avoid conflict with Work and conditions at site; work of other contractors; or Owner; limitations on storage space; availability of personnel and handling equipment and Owner's use of premises.
    3. Schedule delivery to minimize long-term storage at site and to prevent overcrowding of construction spaces.
    4. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.
    5. Deliver products in undamaged, dry condition, in original unopened containers or packaging with identifying labels intact and legible, complete with labels and instructions for handling, storing, unpacking, protecting and installing.
    6. Clearly mark partial deliveries of component parts of equipment to identify equipment and contents to permit easy accumulation of parts and to facilitate assembly.
3. Receiving and Handling:
    1. Provide equipment and personnel to handle products, including those provided by Owner, by methods to prevent soiling and damage.
    2. Provide additional protection during handling to prevent marring and otherwise damaging products, packaging, and surrounding surfaces.
    3. Handle product by methods to avoid bending or overstressing. Lift large and heavy components only at designated lift points.
    4. Immediately on delivery, inspect shipment to assure:
        1) Product complies with requirements of Contract Documents and reviewed submittal.
        2) Quantities are correct.
        3) Accessories and installation hardware are correct.
        4) Containers and packages are intact and labels legible.
        5) Products are protected and undamaged.

3.3 STORAGE

1. General:
    1. Store products, immediately on delivery, in accordance with manufacturer's instructions, with seals and labels intact. Protect until installed.
    2. Arrange storage in a manner to provide access for maintenance of stored items and for inspection.
    3. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
2. Enclosed Storage:
    1. Store products, subject to damage by the elements, in substantial weathertight enclosures.

2. Maintain temperature and humidity within ranges stated in manufacturer's instructions.
3. Provide humidity control and ventilation for sensitive products as required by manufacturer's instructions.
4. Store unpacked and loose products on shelves, in bins, or in neat groups of like items.

3. Exterior Storage:
   1. Provide substantial platforms, blocking, or skids, to support fabricated products above ground; slope to provide drainage. Protect products from soiling and staining.
   2. For products subject to discoloration or deterioration from exposure to the elements, cover with impervious sheet material. Provide ventilation to avoid condensation.
   3. Store loose granular materials on clean, solid surfaces such as pavement, or on rigid sheet materials, to prevent mixing with foreign matter.
   4. Provide surface drainage to prevent erosion and ponding of water.
   5. Prevent mixing of refuse or chemically injurious materials or liquids.
4. Maintenance of Storage:
   1. Periodically inspect stored products on a scheduled basis.
   2. Verify that storage facilities comply with manufacturer's product storage requirements.
   3. Verify that manufacturer required environmental conditions are maintained continually.
   4. Verify that surfaces of products exposed to the elements are not adversely affected; that any weathering of finishes is acceptable under requirements of Contract Documents.
5. Maintenance of Equipment Storage:
   1. For mechanical and electrical equipment in long-term storage, provide manufacturer's service instructions to accompany each item, with notice of enclosed instructions shown on exterior of package.
   2. Service equipment on a regularly scheduled basis, maintaining a log of services; submit as a record document.

3.4 INSTALLATION OF PRODUCTS

1. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.
2. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION

Attachment: Substitution Request Form

SUBSTITUTION REQUEST FORM

DATE: _____
Architect's Project No: _____

Project: _____

To: _____ From: _____

_____ _____

_____ _____

==========

Contractor (Bidder) hereby request acceptance of the following product or system as substitution in accordance with provisions of Section 01600 of the Specifications:

1. SPECIFIED PRODUCT OR SYSTEM:

   Substitution request for : _____

   Specification Section No : _____ Article: _____

2. SUPPORTING DATA:

   _____ Product data adequate for evaluation of the request for proposed substitution is attached (description of product, reference standard, performance and test data, specifications, drawings, photographs).

   _____ Sample is attached.

   _____ Sample will be sent if requested.

3. QUALITY COMPARISON

	SPECIFIED PRODUCT	SUBSTITUTION
Name, Brand:	_____	_____
Catalog No.:	_____	_____
Manufacturer:	_____	_____
Vendor:	_____	_____
Significant Variations:	_____	_____

(Add Additional Sheets If Necessary)

Maintenance Service Available: Yes _____ No _____

Spare Parts Source: _____

Warranty Provided: Yes _____ No _____ Years _____
By Whom: _____

4. PREVIOUS INSTALLATIONS:
Identification of similar projects on which proposed substitution was used:

Project: _____ Architect: _____

Address: _____ Owner: _____

_____ Date Installed: _____

5. REASON FOR NOT GIVING PRIORITY TO SPECIFIED ITEMS:

_____

_____

_____

6. EFFECT OF SUBSTITUTION:
Does the proposed substitution affect other work (adverse or otherwise):
No _____ Yes _____ (if yes, explain)

_____

_____

_____

_____

Substitution Changes Contract Time: No _____ Yes _____
Add/Deduct _____Days

Substitution requires dimensional revisions or redesign of the work: No _____ Yes _____ (if yes, attach explanation data)

Saving of credit to Owner: $ _____

Extra Cost to Owner: $ _____

7. CONTRACTOR'S (BIDDER'S) STATEMENT OF CONFORMANCE OF PROPOSED SUBSTITUTION TO CONTRACT DOCUMENTS:

I/we have investigated the proposed substitution. I/we:

- believe that it is equal or superior in all respects including function, appearance and quality to specified product, except as stated above;
- will provide same warranty and servicing requirements as specified for specified product;
- have included complete cost data and implications of the substitution;
- will pay for changes to the building design and special inspection costs caused by the use of this product;
- will coordinate the incorporation of the proposed substitution in the work;
- waive future claims for added cost to Contract caused by the substitution.

Contractor (Bidder): _____

Date: _____ By: _____

Answer all questions and complete all blanks - use "NA" if not applicable. Unresponsive or incomplete request will be rejected.

==========

ARCHITECT'S REVIEW AND ACTION

_____ Resubmit substitution request

_____ Provide more information in the following areas:

_____

_____

_____ Sign Contractor's (Bidder's) Statement of Conformance

_____ Substitution is accepted.

_____ Substitution is accepted, with the following comments:

_____

_____

_____ Substitution rejected.

_____ Substitution Request received too late.

_____ Date: _____

Architect

SECTION 01 60 05

PRODUCT DELIVERY, STORAGE, AND HANDLING TO MINIMIZE MOLD GROWTH

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes administrative and procedural requirements to help prevent mold contamination and construction.

1.2 SUBMITTALS

A. Reports: Submit reports required in this Section, including but not limited to the following:.
   1. Sightings of existing mold.
   2. Window testing.
   3. Moisture contents of materials.
   4. Exterior sealant cracks, damage, and deterioration.

1.3 QUALITY ASSURANCE

A. Preconstruction Meeting: Review requirements of this Section at Preconstruction Meeting.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufactures written instructions.

B. Do not bring finish materials into building until building is dried-in. Protect finish materials stored within the building. Stage materials off the floor and cover with waterproof covering. Examples of these materials include, but are not limited to, insulation, gypsum, products, wall coverings, cabinets, carpet, ceiling tile, lumber, wood products, etc.

C. Remove from project site damaged materials or materials that have been affected by mold or mildew. Do not install such materials.

D. Contractor to be proactive in construction process to prevent moisture infiltration, and mold growth.

1.5 PRODUCT CONDITIONS

A. Perform visual inspection of existing building for existing mold. Report sighting of mold to Owner and Architect.

B. Remove water found within building during construction immediately.

C. Energize lift stations and sump pumps as early in Project as possible. Use temporary pumps if necessary to get water out of building and drain lines.

1.6 VENTILATION

A. Provide adequate natural air circulation and ventilation.

B. Provide temporary outside air ventilation as building becomes enclosed.

C. Provide natural ventilation during curing of gypsum underlayment.

D. Maintain clean project site, free from hazards, garbage, and debris.

E. Eating, drinking, and smoking are not permitted within building.

F. Slope perimeter grades, both temporary and final grade, away from building structure.

G. Verify that condensate pans drain properly, beginning with initial installation.

H. Flash roof penetrations immediately. Do not allow water to penetrate to floor below.

I. Seal window openings prior to window installation with plastic to prevent rain entry.

J. Cover stored and installed ductwork and installed duct openings with plastic to prevent dust, debris, and moisture from entering ductwork. Repair damaged plastic barrier.

K. Do not operate air handling equipment below 60 degrees F supply air until building is 100 percent enclosed.

L. Check moisture level of all wood products that have been exposed to moisture. Stabilize moisture level at 14-16 percent for 3 days prior to enclosing wood products. Provide logbook for readings.

M. Monitor moisture and temperature for conformance to installation requirements defined by material and equipment manufacturers.

N. Check moisture content of gypsum board that has been exposed to moisture prior to applying finishes. Record findings.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 INSTALLATION

A. Floor drains: Connect floor drains as soon as possible. Do not cover floor drains with tape or other obstructions during construction. Clean out floor drains to mains prior to Substantial Completion.

B. Wall Assemblies:
   1. Install exterior wall insulation, vapor retarder, and gypsum board only after building is enclosed.
   2. Keep bottom of installed gypsum board off floor 1/2 inch.

C. Cavity Conditions: Clean and inspect cavity conditions prior to covering, sealing, and restricting access. Vacuum clean cavity spaces prior to covering and enclosing.

D. Plumbing: Pressure test plumbing piping identified as insulation on Project prior to installation of insulation.

E. Sealants: Inspect exterior sealants for cracks, damage, and deterioration. Record findings and forward to Architect.

F. HVAC Equipment (Permanent HVAC Equipment Used for Temporary Conditioning of Building During Construction Phases): Continuously change filters and clean ductwork interior to remove dirt, dust, debris, and moisture buildup.

3.2 ADJUSTING

A. Remove damaged materials or materials that have become wet. Replace with new materials.

3.3 DEMONSTRATION

A. Train and educate Owner's maintenance personnel on use of building systems. Explain how improper operation and shutting down systems during off periods can create mold problems.

B. Schedule with Owner a review of building for mold problems at 1-year warranty walk-through. Inspect exterior sealants and masonry joints for cracks and other damage or deterioration where water can penetrate building envelope.

C. Explain to Owner the need for the Owner to establish annual building review for mold.

END OF SECTION

SECTION 01 73 00

EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: General procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Construction layout.
   2. Field engineering and surveying.
   3. General installation of products.
   4. Progress cleaning.
   5. Starting and adjusting.
   6. Protection of installed construction.
   7. Correction of the Work.

1.2 SUBMITTALS

A. Certificates: Submit certificate signed by land surveyor or professional engineer certifying that location and elevation of improvements comply with requirements.

B. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

C. Certified Surveys: Submit two copies signed by land surveyor or professional engineer. Surveys to include building locations (building corners and finish floor elevations).

D. Final Property Survey: Submit 5 copies showing the Work performed and record survey data.

1.3 QUALITY ASSURANCE

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

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
   1. Before construction, verify the location and points of connection of utility services.

B. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
   1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
   2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
   3. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Owner and Architect promptly.

B. General: Engage a land surveyor or professional engineer to lay out the Work using accepted surveying practices.
   1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
   2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
   3. Inform installers of lines and levels to which they must comply.
   4. Check the location, level and plumb, of every major element as the Work progresses.
   5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
   6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
   1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

C. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor or professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
   1. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical work plumb and make horizontal work level.
   2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
   3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
   2. Allow for building movement, including thermal expansion and contraction.

F. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

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

3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
   1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
   2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
   3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
   1. Remove liquid spills promptly.
   2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

G. All on site debris must be cleared and disposed of in a proper manner.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Section 01 73 29 - Cutting and Patching.
   1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Procedural requirements for cutting and patching.

1.2 DEFINITIONS

A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.3 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
   1. Necessity: Describe why cutting and patching cannot be avoided.
   2. Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
   3. Description of proposed Work:
      a. Scope of cutting, patching, alteration, or excavation.
      b. Trades which will execute Work.
      c. Products proposed to be used.
      d. Extent of refinishing to be done.
   4. Dates: Indicate when cutting and patching will be performed.
   5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.
   6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
   7. Cost proposal, when applicable.
   8. Written permission of trades whose Work will be affected.
   9. Architects Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.4 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their structural capacity.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
   1. Water, moisture, or vapor barriers.
   2. Membranes and flashings.
   3. Exterior curtain-wall construction.
   4. Equipment supports.
   5. Piping, ductwork, vessels, and equipment.
   6. Noise- and vibration-control elements and systems.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.5 PAYMENT FOR COSTS

A. Cost caused by ill-timed or defective Work or Work not conforming to Contract Documents, including costs for additional services of Architect and Engineer to be paid by Contractor.

B. Cost of Work done on written instructions of Architect, other than defective or nonconforming Work, will be paid by Owner on approval of written Change Order. Provide written cost proposals prior to proceeding with cutting and patching proposed by Architect.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections of these Specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect existing conditions of Work, including elements subject to movement or damage during cutting and patching, and excavating and backfilling. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
   1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
   2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
   1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes as shown on Drawings and as specified.

C. Fit Work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces. Conform to fire code requirements for penetrations and maintain integrity of fire walls and ceilings.

D. Restore Work which has been cut or removed. Install new products to provide completed Work in accordance with requirements of Contract Documents and as required to match surrounding areas and surfaces.

E. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
   1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
   3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
   4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
   5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
   6. Proceed with patching after construction operations requiring cutting are complete.

F. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
   1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
   2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

END OF SECTION

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Inspection procedures.
   2. Project Record Documents.
   3. Operation and maintenance manuals.
   4. Emergency Manuals
   5. Warranties.
   6. Instruction of Owner's personnel (Demonstration and Training).
   7. Final cleaning.

1.2 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: The following items shall be completed prior to requesting inspection for determining date of Substantial Completion:
   1. Prepare a list of items to be completed and corrected (punch list). Include the value of items on the list.
      a. Preparation: Submit 3 copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including areas disturbed by Contractor.
      b. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
      c. Organize items applying to each space by major element.
   2. Advise Owner of pending insurance changeover requirements.
   3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
   4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs and photographic negatives, damage or settlement surveys, property surveys, and similar final record information.
   6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
   7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
   8. Complete startup testing of systems.
   9. Submit test/adjust/balance records.
   10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
   11. Advise Owner of changeover in heat and other utilities.
   12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
   13. Complete final cleaning requirements, including touchup painting.
   14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items that must be completed or corrected before certificate will be issued.
   1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
   2. Results of completed inspection will form the basis of requirements for Final Completion.

1.3 FINAL COMPLETION

A. Preliminary Procedures: Prior to requesting final inspection for determining date of Final Completion, complete the following:
   1. Submit a final Application for Payment in accordance with Section 01 29 00 - Payment Procedures.
   2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
   3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
   4. Submit pest-control final inspection report and warranty.
   5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
   1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.4 PROJECT RECORD DOCUMENTS

A. General: Contractor shall maintain a complete and accurate record of changes or deviations from the Contract Documents and Shop Drawings, indicating the Work as actually installed. Record information in the appropriate locations on a record set of prints of the Drawings and Shop Drawings and a copy of the Specifications that are maintained solely for the purpose of this documentation. Keep this record set of Contract Documents and Shop Drawings at the project site for review by the Owner and Architect.
   1. Do not use Project Record Documents for construction purposes.
   2. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.
   3. The Individual or entity who obtains record data shall prepare Record Documents.
   4. Information contained in the record documents shall include, but not be limited to:
      a. Actual installation where actual installation varies from original drawings
      b. Modifications made by Addenda, Change Orders, Construction Change Directives and Architect's Supplemental Instructions which shall be transferred to the record documents.
      c. Location of underground pipes, conduits, ducts, cables and similar work, dimensioned horizontally to permanent points of reference and located vertically by indicating depth of burial. Dimensions shall be accurate within ±6 inches.
      d. Location of plumbing piping, sprinkler piping, control valves, heating and air conditioning equipment, mechanical piping, ductwork, major conduit runs, power, control and alarm wiring, etc., dimensioned horizontally to permanent points of reference. Dimensions shall be accurate within 6 inches.
      e. Modifications made to accommodate field conditions.

f. Location and function of mechanical and electrical control devices and shut-off valves.
g. Final circuiting of electrical fixtures and equipment.
1) Record and check the markup before enclosing concealed installations.
h. Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.

B. Final Record Drawings:
1. Prepare a full set of corrected transparencies of the Contract Drawings and Shop Drawings.
2. Incorporate changes and additional information previously marked on Record Prints. Erase, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Architect for resolution.
4. Architect will make the Contract Drawings available to Contractor to be printed at Contractor's expense.

C. Number of Copies:
1. Initial Submittal: Submit one set of corrected Record Transparencies and one set of marked-up Record Prints.
2. Final Submittal:
a. Marked-up Record Prints: One set.
b. Record Prints: One set.
c. Copies printed from Record Prints: 3 copies. Print each Drawing, whether or not changes and additional information were recorded.

D. Format:
1. Record Prints: Organize Record Prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

E. Identification: Provide the following information on each Drawing:
1. Project name.
2. Date.
3. Designation "PROJECT RECORD DRAWINGS."
4. Name of Architect.
5. Name of Contractor.

F. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Where installation varies from that indicated, mark copy to indicate the actual product installation.
1. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
2. Note related Change Orders and Record Drawings.

G. Miscellaneous Record Submittals: Bind or file miscellaneous records with identification labels clearly visible.

1.5 OPERATION AND MAINTENANCE MANUALS

A. General: Assemble 3 copies of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:
1. Operation Data: Include complete operating sequence, control diagrams, description of method of operating machinery, machine serial numbers, factory order numbers, parts, tests, instruction books, suppliers phone numbers and addresses, individual equipment guarantees, parts and part numbers.

2. Maintenance Data: Include manufacturer's information, a list of spare parts, maintenance procedures, maintenance and service schedules for preventive and routine maintenance, and copies of warranties and bonds. Include lists of filter sizes for air handling equipment, indicating which unit filter if for and if filter is “washable" or "disposable".

B. Organization:
   1. Organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system.
   2. Include a title page and table of contents in each manual.

C. Format:
   1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
      a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents. Indicate volume number for multiple-volume sets.
   2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
   3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
   4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
      a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
      b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

D. Provide manufacturer’s operations and maintenance videotapes of each specific equipment item or system.

E. Upon substantial completion of the Project Work, submit one copy of the Maintenance Manual and Operating Instructions to the Architect for approval. Upon receipt of Notice of Approval, deliver the additional copies to the Owner.

1.6 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for type of emergency, emergency instructions, and emergency procedures. Include instructions and procedures for each system, subsystem, piece of equipment, and component.

B. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

C. Emergency Procedures: Include instructions on stopping, shutdown instructions for each type of emergency, operating instructions for conditions outside normal operating limits, and required sequences for electric or electronic systems.

1.7 WARRANTIES

A. Submittal Time: Submit written warranties upon request of Architect for designated portions of the Work where commencement of warranties. Warranties will begin at substantial completion of entire project. There will be no interim dates. All warranties to have same one year period.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
   1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
   2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
   3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

C. Include and additional copy of each warranty in the operation and maintenance manuals.

1.8 OWNER'S MANUAL

A. Prior to final payment, submit one hard-back, loose-leaf binder containing the following items, typed, indexed and labeled for ready reference:
   1. Subcontractors, major suppliers list with company's names, addresses and telephone numbers.
   2. Certifications.
   3. Affidavit from general and subcontractors on use of asbestos free materials.
   4. List of Extra Materials supplied to Owner, signed by Owner's representative.
   5. Other items required by the Specifications.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING

A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment.
   1. Provide instructors experienced in operation and maintenance procedures.
   2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
   3. Schedule training with Owner, through Architect. Provide a minimum of 7 days' advance notice.
   4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.
   5. Include video of actual demonstration as part of turnover.

B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment type, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline.
   1. Include instruction for system design and operational philosophy, review of documentation, operations, adjustments, troubleshooting, maintenance, and repair.

3.2 FINAL CLEANING

A. General: Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Comply with manufacturer's written instructions.
   1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
      a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
      b. All on site debris must be cleared and disposed of in a proper manner.
      c. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
      d. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
      e. Remove tools, construction equipment, machinery, and surplus material from Project site.
      f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
      g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
      h. Sweep concrete floors broom-clean in unoccupied spaces.
      i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
      j. Clean transparent materials, including mirrors and glass in doors and windows, taking care not to scratch surfaces. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
      k. Remove labels that are not permanent.
      l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
         1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
      m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
      n. Replace parts subject to unusual operating conditions.
      o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
      p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
      q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

r. Leave Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

E. Make building(s) ready for occupancy in every respect. Lay heavy building paper in main circulation areas to protect the floors until final inspection and acceptance.

F. Existing improvements, inside or outside the property which are disturbed, damaged or destroyed by the Work under the Contract shall be restored to the condition in which they originally were, or to the satisfaction of the Architect.

END OF SECTION

SECTION 02 36 10

SOIL TREATMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Soil treatment for subterranean termite protection.

1.2 SUBMITTALS

A. Product Data: Treatments and application instructions, including EPA-Registered Label and State approval.

B. Product Certificates: For termite control products, signed by product manufacturer.

C. Qualification Data: For Installer of termite control products

D. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's record information, including the following:
   1. Date and time of application.
   2. Moisture content of soil before application.
   3. Brand name and manufacturer of termiticide.
   4. Quantity of undiluted termiticide used.
   5. Dilutions, methods, volumes, and rates of application used.
   6. Areas of application.
   7. Water source for application.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located and shall have a minimum of 5 years documented experience with projects of similar scope and nature.

B. Regulatory Requirements: Formulate and apply termiticides, and label with a Federal registration number, to comply with EPA regulations and authorities having jurisdiction.

C. Source Limitations: Obtain termite control products from a single manufacturer for each product.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 - Project Management and Coordination to schedule application of termiticide products.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply treatment to soil that is water saturated or frozen or while precipitation is occurring. Comply with EPA-Registered Label requirements and requirements of authorities having jurisdiction.

1.5 COORDINATION

A. Coordinate soil treatment application with excavating, filling, and grading and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs, before construction.

1.6 WARRANTY

A. Warranty: Provide written warranty, signed by applicator and Contractor certifying that soil treatment will work as specified herein, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
   1. Warranty Period: Five years from date of Substantial Completion.
   2. Draft warranty in favor of Owner, successors or assigns.
      a. Pre-printed FHA or VA guarantee forms shall not be acceptable.
      b. The Owner and the applicator reserve the option to renew termite protection on an annual basis after the expiration of the warranty.

B. Upon evidence of subterranean termite activity within warranty period, re-treat area to stop infestation of affected areas and repair damage to building and contents at no cost to Owner.
   1. Re-treatment under warranty sufficient to prevent termites from attacking building or its contents during remainder of initial warranty period, plus one additional year for each time re-treatment under warranty is required.
   2. Complete re-treatment of the building shall be as specified herein and shall be rendered upon the third recurrence of subterranean termites in the same structure within 5-year period from the date of project acceptance.
   3. Damage caused by infestations and by re-treatment shall be repaired at no cost to the Owner.

C. Upon evidence of vegetation growth, re-treat area at no cost to Owner.

1.7 MAINTENANCE SERVICE

A. Continuing Service: Beginning at Substantial Completion, provide 12 months' continuing service including monitoring, inspection, and re-treatment for occurrences of termite activity. Provide a standard continuing service agreement. State services, obligations, conditions, and terms for agreement period; and terms for future renewal options.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Dragnet FSR (Permethrin), FMC Corporation.
      b. Torpedo (Permethrin); ICI Americas, Inc.
      c. Biflex TC (3rd generation synthetic pyrethroid), FMC Corporation
      d. Termidor; Aventis Environmental Science USA LP
      e. Premise 75.; Bayer Corporation

B. Vegetation Treatment:
   1. Chemical Control: Roundup or Doomsday.
   2. Pre-Emergent: Surflan, Dacthal or approved equal.

C. Mix solutions in accordance with Manufacturer's directions to highest concentration allowable by label and local regulations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. With Applicator present, examine substrates, areas, and conditions, for compliance with requirements for moisture content of the soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparation before beginning application of soil treatment. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and footings.
   1. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.

C. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 APPLICATION

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

B. Termicide: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute the treatment evenly.
   1. Slabs-on-Grade: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
   2. Foundations: Adjacent soil including soil along entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers, piers, and chimney bases; and along entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
   3. Masonry: Treat voids.
   4. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.

5. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

C. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

D. Post warning signs in areas of application.

F. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

3.4 FIELD QUALITY CONTROL

A. Tests: Chemical analysis tests shall be made of materials used on the basis of one test for each 10,000 square feet of treated area. Samples and test may be taken of both concentrates and the dilute materials as being applied.

END OF SECTION

SECTION 02 78 10 - UNIT PAVERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Brick pavers set in aggregate setting bed.
2. Concrete pavers set in aggregate setting bed.
3. Rough-stone pavers set in mortar setting bed.
4. Edge restraints for unit pavers.

1.2 SUBMITTALS

A. Product Data: For each product indicated.

B. Samples: Showing the full range of colors, textures, and patterns available for each type of unit paver indicated.

1. Include Samples of material for joints and accessories involving color selection.

1.3 QUALITY ASSURANCE

A. Build mockups for each form and pattern of unit paver.

1. Build mockups as shown on Drawings.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 PROJECT CONDITIONS

A. Cold-Weather Protection: Do not use frozen materials or build on frozen subgrade or setting beds.

B. Cold-Weather Requirements for Mortar and Grout: Heat materials to provide mortar and grout temperatures between 40 and 120 deg F. Protect unit paver work against freezing for 24 hours after installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 COLORS AND TEXTURES

A. Colors and Textures: As indicated by manufacturer's designations to be selected by architect from mfg. full line of colors and textures.

2.3 UNIT PAVERS

A. Brick Pavers: Light-traffic paving brick; ASTM C 902, Class MX, Type III, Application PX. Provide brick without frogs or cores in surfaces exposed to view in the completed Work.

1. Manufacturers:

a. Acme Brick Co.
b. Belden Brick Co.
c. Boral Bricks, Inc.

B. Concrete Pavers: Solid, interlocking paving units, ASTM C 936, made from normal-weight aggregates in sizes and shapes indicated.

1. Manufacturers:

a. Pavestone
b. Capitol Ornamental Concrete Specialties, Inc.
c. Hanover Architectural Products, Inc.
d. Hastings Pavement Co., Inc.
e. Nicolock.
f. Oldcastle Architectural Products.
g. Sunny Brook Pressed Concrete Co.
h. Wassau Tile, Inc.; Terra-Paving Div.

C. Rough-Stone Pavers: Rectangular paving stones, with split faces and edges, made from granite complying with ASTM C 615.

1. Manufacturers:

a. Buechel Stone Corp.
b. Cold Spring Granite Co.
c. New England Stone Industries, Inc.
d. North Carolina Granite Corp.

2.4 ACCESSORIES

A. Plastic Edge Restraints: Manufacturer's standard triangular PVC extrusions, 1-3/4 inches high by 3-1/2 inches wide; rigid type for straight edges and flexible type for curved edges, with pipe connectors and 3/8-inch diameter by 12-inch- long steel spikes.

1. Manufacturers:

a. Pave Tech Inc.
b. Ryerson, J. T. & Son, Inc.
c. Pavestone

B. Cork Joint Filler: Preformed strips complying with ASTM D 1752, Type II.

C. Compressible Foam Filler: Preformed strips complying with ASTM D 1056, Grade 2A1.

2.5 AGGREGATE SETTING-BED MATERIALS

A. Graded Aggregate for Base: Sound crushed stone or gravel complying with ASTM D 448 for Size No. 8.

B. Geotextile: Woven or nonwoven polyester or polypropylene geotextile, with a permeability rating 10 times greater than that of subgrade soil and an apparent opening size small enough to prevent passage of fines from leveling course into base course.

C. Sand for Leveling Course: Sound, sharp, washed sand complying with gradation requirements of ASTM C 33 for fine aggregate.

D. Sand for Joints: Sharp, washed sand with 100 percent passing No. 16 sieve.

2.6 PORTLAND CEMENT-LIME MORTAR SETTING-BED MATERIALS

A. Portland Cement: ASTM C 150, Type I or II.

B. Hydrated Lime: ASTM C 207, Type S.

C. Aggregate: ASTM C 144.

D. Water: Potable.

2.7 MORTAR AND GROUT MIXES

A. General: Comply with referenced standards and with manufacturers' written instructions. Discard mortars and grout when they have reached their initial set.

B. Cement-Paste Bond Coat: Mix bond coat to a consistency similar to that of thick cream and consisting of either neat cement and water or cement, sand, and water.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.

B. Cut unit pavers with motor-driven masonry saw to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible.

1. For concrete pavers, a block splitter may be used.

C. Joint Pattern: Running bond & Herringbone as indicated in the drawings.

D. Tolerances: Do not exceed 1/16-inch unit-to-unit offset from flush nor 1/8 inch in 24 inches and 1/4 inch in 10 feet from level, or indicated slope.

E. Expansion and Control Joints: Provide joint filler as backing for sealant-filled joints where indicated. Install joint filler before setting pavers.

F. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.

3.2 AGGREGATE SETTING-BED PAVER APPLICATIONS

A. Compact soil subgrade uniformly to at least 95 percent of ASTM D 1557 laboratory density.

B. Proof-roll prepared subgrade and correct deficient areas.

C. Place aggregate base in thickness indicated. Compact by tamping with plate vibrator.

D. Place geotextile over base course, overlapping ends and edges at least 12 inches.

E. Place leveling course and screed to a thickness of 1 to 1-1/2 inches, taking care that moisture content remains constant and density is loose and constant until pavers are set and compacted.

F. Treat leveling base with soil sterilizer to inhibit growth of grass and weeds.

G. Set pavers with a minimum joint width of 1/16 inch and a maximum of 1/8 inch, being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars.

H. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf compaction force at 80 to 90 Hz.

I. Spread dry sand and fill joints immediately after vibrating pavers into leveling course. Vibrate pavers and add sand until joints are completely filled, then remove excess sand. Leave a slight surplus of sand on the surface for joint filling.

3.3 MORTAR SETTING-BED APPLICATIONS

A. Saturate concrete subbase with clean water several hours before placing setting bed. Remove surface water about one hour before placing setting bed.

B. Apply cement-paste bond coat over surface of concrete subbase before placing setting bed. Limit area of bond coat to avoid its drying out before placing setting bed. Do not exceed 1/16-inch thickness for bond coat.

C. Apply mortar bed over bond coat immediately after applying bond coat. Spread and screed to elevations required for accurate setting of pavers to finished grades indicated.

D. Mix and place only that amount of mortar bed that can be covered with pavers before initial set. Cut back, bevel edge, and discard material that has reached initial set before placing pavers.

E. Wet brick pavers before laying if the initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at the time of laying.

F. Place pavers before initial set of cement occurs. Immediately before placing pavers, apply uniform 1/16-inch- thick, slurry bond coat to bed or to back of each paver.

G. Tamp or beat pavers with a wooden block or rubber mallet to obtain full contact with setting bed and to bring finished surfaces within indicated tolerances. Set each paver in a single operation before initial set of mortar; do not return to areas already set and disturb pavers for purposes of realigning finished surfaces or adjusting joints.

H. Spaced Joint Widths: Provide 3/8-inch nominal joint width with variations not exceeding plus or minus 1/8 inch.

I. Grout joints as soon as possible after initial set of setting bed. Force grout into joints, taking care not to smear grout on adjoining pavers and other surfaces. After initial set of grout, finish joints by tooling slightly concave.

J. Cure grout by maintaining in a damp condition for seven days, unless otherwise recommended by latex-additive manufacturer.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 312000 "Earth Moving" for drainage fill under slabs-on-grade.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete mixture.

C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement.

1.3 INFORMATIONAL SUBMITTALS

A. Material certificates.

B. Material test reports.

C. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.

D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1.5 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.6 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1.

1. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301.
2. ACI 117.

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

C. Galvanized Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed bars, ASTM A 767/A 767M, Class I zinc coated after fabrication and bending.

D. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.

E. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

F. Galvanized-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from galvanized-steel wire into flat sheets.

G. Epoxy-Coated Welded-Wire Reinforcement: ASTM A 884/A 884M, Class A coated, Type 1, deformed steel.

H. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

2.4 CONCRETE MATERIALS

A. Cementitious Materials:

1. Portland Cement: ASTM C 150/C 150M, Type I/II, gray.
2. Fly Ash: ASTM C 618, Class F or C.
3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
4. Blended Hydraulic Cement: ASTM C 595/C 595M, Type IS, portland blast-furnace slag cement.

B. Normal-Weight Aggregates: ASTM C 33/C 33M, graded.

1. Maximum Coarse-Aggregate Size: 1 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Lightweight Aggregate: ASTM C 330/C 330M, 3/4-inch nominal maximum aggregate size.

D. Air-Entraining Admixture: ASTM C 260/C 260M.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

F. Water: ASTM C 94/C 94M and potable.

2.5 WATERSTOPS

A. Flexible Rubber Waterstops: CE CRD-C 513, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

B. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber waterstops, for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals. Factory fabricate corners, intersections, and directional changes.

C. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

D. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

E. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer-modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch.

2.6 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

B. Sheet Vapor Retarder: ASTM E 1745, Class B. Include manufacturer's recommended adhesive or pressure-sensitive tape.

C. Sheet Vapor Retarder: ASTM E 1745, Class C. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.

D. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick.

2.7 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating.

G. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating.

H. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

I. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.8 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

2.9 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

B. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.

C. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

2.10 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Normal-Weight Concrete:

1. Minimum Compressive Strength: 3000 psi at 28 days.
2. Maximum W/C Ratio: 0.45.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
6. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 1.0 lb/cu. yd.

2.11 FABRICATING REINFORCEMENT

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

2.12 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.

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

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR-RETARDER INSTALLATION

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.4 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

3.6 WATERSTOP INSTALLATION

A. Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions.

3.7 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3.8 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view.

C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix 1 part portland cement to 1-1/2 parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in

amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.

3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix 1 part portland cement and 1 part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.9 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.

1. Apply scratch finish to surfaces indicated and to receive concrete floor toppings.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
2. Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.10 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

    a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.11 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.12 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

END OF SECTION 03 30 00

SECTION 04 01 20

MASONRY CLEANING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Cleaning masonry surfaces, including concrete masonry units.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's data for each product specified, including application rates and instructions.

B. Samples for Verification: Prior to erecting mockup, procure and clean 2 samples of each type of masonry used on work. Cleaned samples shall be submitted to Architect for review of aesthetics and effectiveness.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Engaged in producing masonry cleaners that have been used for similar applications with successful results for a minimum of 5 years, and with factory-trained representatives who are available for consultation and Project-site inspection and assistance at no additional cost.
   2. Applicator: Trained, approved and accepted by the cleaning compound manufacturer. Application personnel shall have at least 2 years experience with the particular materials being applied.

B. Mockups: Clean an area approximately 10-20 sq. ft. or larger as required to demonstrate effectiveness of cleaner on each type of masonry unit used. If approved by Architect, cleaner may be applied to mock-up constructed in Section 04 20 00 – Unit Masonry Assemblies.
   1. Prepare mockups on existing walls under same weather conditions to be expected during remainder of the Work.
   2. Test cleaners and methods on samples of adjacent non-masonry materials for possible adverse reactions. Samples of tested materials shall be available for Architect's review upon request.
   3. Allow a waiting period of not less than seven days after completion of sample cleaning to permit a study of sample panels for negative reactions.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened containers, labeled with manufacturer's name, batch number, and type of products.

B. Storage and Protection:
   1. Store materials in original, unopened containers in compliance with manufacturer's printed instructions.
   2. Do not store in areas where temperature will fall below 20 degrees F. or rise above 100 degrees F.

1.5 PROJECT CONDITIONS

A. Temperature and humidity levels shall conform to manufacturer’s requirements during and after application.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS

A. Water for Cleaning: Potable.

B. Chemical Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
   1. Cleaner shall be a solution of blended liquid acids, heavily inhibited and emulsified and in combination with special wetting systems.
   2. Specific product selection shall be dependent upon substrate as recommended by the chemical cleaner manufacturer.
   3. Cleaner shall be acceptable to the masonry unit manufacturer. Verify appropriate type of cleaner with masonry unit manufacturer and cleaner manufacturer prior to commencing work.
   4. Muriatic acid shall not be acceptable as a chemical cleaner for new masonry.
   5. Products: Subject to compliance with requirements and approval of manufacturer, provide one of the following:
      a. Cleaners for Red and Dark-Colored Brick Not Subject to Metallic Staining:
         1) 200 Lime Solv; Diedrich Technologies, Inc.
         2) Sure Klean No. 101 Lime Solvent; ProSoCo., Inc.
      b. Cleaners for Brick Subject to Metallic Staining:
         1) 202V Vana-Stop; Diedrich Technologies, Inc.
         2) Sure Klean Vana Trol; ProSoCo, Inc.
      c. Cleaners for concrete masonry units:
         1) 202 New Masonry Detergent; Diedrich Technologies, Inc.
         2) Sure Klean No. 600 Detergent; ProSoCo, Inc.

C. Dilute chemical cleaners with water to produce solutions not exceeding concentration recommended by chemical cleaner manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection:
   1. Protect surrounding surfaces and installed Work from run-off, overspray or splashing.
      a. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of restoration and cleaning work.
   2. Comply with chemical cleaner manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical cleaning solutions from coming into contact with pedestrians, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.

a. Cover adjacent surfaces with materials that are proven to resist chemical cleaners used. Use materials that contain only waterproof, UV-resistant adhesives. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. Promptly remove masking after cleaner application to prevent adhesive staining.
b. Keep wall wet below area being cleaned to prevent streaking from runoff.
c. Do not clean masonry during winds of sufficient force to spread cleaning solutions to unprotected surfaces.
d. Neutralize and collect alkaline and acid wastes for disposal off Owner's property.
e. Dispose of runoff from cleaning operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

3. Prevent mortar from staining face of surrounding masonry and other surfaces.
   a. Cover sills, ledges, and projections to protect from mortar droppings.
   b. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.
   c. Immediately remove mortar in contact with exposed masonry and other surfaces.
   d. Clean mortar splatters from scaffolding at end of each day.

B. Surface Preparation:
1. Prepare surfaces in strict accordance with manufacturer's printed instructions.
2. Masonry walls shall be cleaned 14-28 days after installation to remove mortar. High strength mortar/grout should be removed within 7 days.
3. Point up cracks, other than hairline cracks.
4. Defective mortar joints shall be routed out, pointed with mortar and tooled.
5. Before beginning general cleaning, remove extraneous substances that are resistant to cleaning methods being used. Extraneous substances include paint, calking, asphalt, and tar.
6. Carefully remove heavy accumulations of material from surface of masonry with sharp chisel. Do not scratch or chip masonry surface.
7. Remove paint and calking with approved alkaline or solvent paint remover.
   a. Comply with requirements for paint removal.
   b. Repeat application up to two times if needed.
8. Remove asphalt and tar with approved asphalt and tar remover solution.
   a. Apply only to asphalt and tar by brush without prewetting.
   b. Allow paint remover to remain on surface for 10 to 30 minutes.
   c. Rinse off with water using low-pressure spray.
   d. Repeat application if needed.

3.2 CLEANER APPLICATION

A. Apply cleaner in strict accordance with manufacturer’s printed instructions.
1. Do not use wire brushes or brushes that are not resistant to chemical cleaner being used. Do not use plastic-bristle brushes if natural-fiber brushes will resist chemical cleaner being used.
2. Use spray equipment that provides controlled application at volume and pressure recommended by manufacturer, measured at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage masonry.
   a. Equip units with pressure gages.
3. Chemical cleaner spray application: Use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with cone-shaped spray tip.
4. Water spray application: Use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
5. High-pressure water spray application: Use fan-shaped spray tip that disperses water at an angle of at least 40 degrees.

B. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces.

C. Water Application Methods:
   1. Water Soak Application: Soak masonry surfaces by applying water continuously and uniformly to limited area for time indicated. Apply water at low pressures and low volumes in multiple fine sprays using perforated hoses or multiple spray nozzles. Erect a protective enclosure constructed of polyethylene sheeting to cover area being sprayed.
   2. Spray Applications: Unless otherwise indicated, hold spray nozzle at least 6 inches from surface of masonry and apply water in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.

D. Chemical Cleaner Application Methods: Apply chemical cleaners to masonry surfaces in accordance with manufacturer's written instructions; use brush or spray application methods, at Contractor's option. Do not spray apply at pressures exceeding 50 psi. Do not allow chemicals to remain on surface for periods longer than those indicated or recommended by manufacturer.
   1. Reapply cleaner as recommended by manufacturer prior to removing excess mortar.

E. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting. Periodically during each rinse, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed.
   1. Apply neutralizing agent and repeat rinse, if necessary, to produce tested pH of between 6.7 and 7.5.

F. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

3.3 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, spray applied at low pressure.
   1. Do not use metal scrapers or brushes.
   2. Do not use acidic or alkaline cleaners.

B. Wash adjacent woodwork and other nonmasonry surfaces. Use detergent and soft brushes or cloths.

C. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

D. Sweep and rake adjacent pavement and grounds to remove mortar and debris. Where necessary, pressure wash surfaces to remove mortar, dust, dirt, and stains.

END OF SECTION

SECTION 04 20 00

UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Unit masonry assemblies as follows:
   1. Concrete masonry units.
   2. Mortar and grout.
   3. Reinforcing steel.
   4. Masonry joint reinforcement.
   5. Miscellaneous masonry accessories.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's data for each different masonry unit, accessory and other manufactured product specified.

B. Shop Drawings:
   1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."

C. Samples:
   1. Masonry: Submit 2 full-size units for each different exposed masonry unit required, showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.

D. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
   1. Each type of masonry unit required.
      a. Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
   2. Each cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
   3. Each material and grade indicated for reinforcing bars.
   4. Each type and size of joint reinforcement.
   5. Each type and size of anchor, tie, and metal accessory.

1.3 QUALITY ASSURANCE

A. Source Limitations
   1. Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.
   2. Mortar Materials: Obtain mortar ingredients of a uniform quality, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

B. Standards:
   1. Comply with the requirements of ACI 530.1/ASCE 6 "Specifications for Masonry Structures", except as otherwise indicated.

C. Regulatory Requirements:

1. Masonry materials and workmanship shall meet requirements of building codes which are applicable to jurisdiction in which Project is located.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Transport and handle masonry units in such a manner as to prevent chipping and breakage.

B. Store masonry units on elevated platforms in a dry location.

C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

D. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

E. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

F. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

G. Replace damaged material at no cost to Owner.

1.5 PROJECT CONDITIONS

A. Cold-Weather Requirements:
   1. Protect masonry units from freezing weather and prevent accumulation of ice.
   2. Do not build on frozen substrates.
   3. Remove and replace unit masonry damaged by frost or by freezing conditions.
   4. Do not lay concrete masonry units when temperature of surrounding atmosphere is below 40 degrees F. or is likely to fall below 40 degrees F. in the 24 hour period after laying, unless adequate protection is provided.
   5. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

B. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.
   1. When ambient temperature exceeds 100 deg F, or 90 deg F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.

1.6 SCHEDULING

A. Coordination: Coordinate with other Trades whose Work relates to concrete masonry unit installation for placing required blocking, backing, furring, conduits and other items.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. General:
   1. Concrete masonry units shall meet ASTM C90, Grade I requirements
      a. Exposed Units: ASTM C90-98, paragraph 7.2.1 shall be modified to read: "Three percent of a shipment containing chips not larger than 1/2 inchin any dimension, or cracks not wider than 0.02 inches and not longer than 10% of the nominal height of the unit is permitted."
   2. Units shall be in the same condition in wall as they were upon delivery.
   3. Units not complying with the appropriate ASTM Standards shall not be laid in the wall where exposed to view. Any unit that is chipped in excess of the requirements will be rejected and shall be removed and replaced.
   4. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.

B. Concrete Masonry Units:
   1. Unit Compressive Strength: As indicated on General Structural Notes or Drawings.
   2. Weight Classification: Medium weight or Normal weight, unless otherwise indicated.
   3. Sizes: As indicated on Drawings.
   4. Smooth Face:
      1) Color: As selected by Architect.

2.2 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type II, Type V shall be used at locations in contact with soil. Provide natural color as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.

D. Aggregate:
   1. Mortar: ASTM C 144; Clean, sharp and well graded and free from injurious amounts of dust, lumps, shale, alkali, surface coatings and organic matter, conforming to ASTM C144, except that no less than 3 percent nor more than 10 percent shall pass a No. 100 sieve except for joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
   2. Grout: ASTM C 404.

E. Water: Potable.

2.3 REINFORCING STEEL

A. Uncoated Steel Reinforcing Bars: ASTM A 615; ASTM A 616, including Supplement 1; or ASTM A 617, Grade 60.

2.4 MASONRY JOINT REINFORCEMENT

A. General: ASTM A 951 and as follows:
   1. Single-wythe masonry: Ladder type with single pair of side rods and cross rods spaced not more than 16 inches o.c.
   2. Material: Hot-dip galvanized, carbon-steel wire.
   3. Wire Size for Rods:
      a. 1/4 inch to 3/8 inch joints: W1.7 or 0.148-inch diameter.

b. 1/2 inch joints: W2.8 or 0.188-inch diameter.

4. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units where indicated.

2.5 MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane or PVC.

B. Preformed Control-Joint Gaskets: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
1. Styrene-Butadiene-Rubber Compound: ASTM D 2000, Designation M2AA-805.
2. PVC: ASTM D 2287, Type PVC-65406.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Round Plastic Weep/Vent Tubing: Medium-density polyethylene, 3/8-inch OD by 4 inches long.

E. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication.
1. Provide units with either two loops or four loops as needed for number of bars indicated.

F. Vinyl lintel covers at all steel angle lintels.

2.6 MORTAR AND GROUT MIXES

A. General: Use only those admixtures indicated. .
1. Do not use calcium chloride in mortar or grout.
2. Add cold-weather admixture (if used) at the same rate for all mortar, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: ASTM C 270, Proportion Specification.
1. For masonry below grade, in contact with earth, and where indicated: Type M.
2. Other Locations: Type S.

D. Grout for Unit Masonry: Comply with ASTM C 476.
1. Job-Site Mixed: In accordance with ASTM C476.
2. Transit-Mixed:
   a. Designed by the supplier or an independent testing laboratory with a minimum compressive strength as indicated in the General Structural Drawings and Notes.
   b. Slump: Not to exceed 8 inches, as measured according to ASTM C 143, unless otherwise noted on Drawings.
   c. Use within 1-1/2 hours of initial mixing and do not use grout after it has begun to set or after it has become harsh or non-plastic.

E. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's directions.

2.7 SOURCE QUALITY CONTROL

A. Owner will engage a qualified independent testing agency to perform source quality-control testing indicated below:
   1. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.

B. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to ASTM C 140.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present for compliance with requirements for installation tolerances and other conditions affecting performance. Notify Contractor, in writing, conditions detrimental to proper and timely completion of Work. Do not proceed with the installation of unit masonry Work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
   1. Verify that foundations are within tolerances specified.
   2. Verify that reinforcing dowels are properly placed.
   3. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Before installation, examine rough-in and built-in construction to verify actual locations of piping connections.

3.2 PROTECTION

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
   1. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread on ground and over wall surface.
   2. Protect sills, ledges, and projections from mortar droppings.
   3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
   4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

3.3 INSTALLATION - GENERAL

A. General:
   1. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications.

2. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.
3. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction. Where possible, use full-size units without cutting. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
4. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

3.4 ERECTION

A. Workmanship: Concrete masonry units which will be exposed in the finished work shall be treated as an architectural finish and shall be handled carefully to ensure that chippages do not occur during handling and laying. Handling shall be minimized on the jobsite to eliminate chances for chippage.

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

C. Bond Pattern: One-half running bond with vertical joint in each course centered on units in courses above and below. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

F. Fill space between hollow-metal frames and masonry solidly with mortar, unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

H. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

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

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than the joint thickness, unless otherwise indicated.

C. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.6 MASONRY JOINT REINFORCEMENT

A. General: Provide continuous masonry joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
   1. Space reinforcement not more than 16 inches o.c.
   2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
   3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.
      a. Reinforcement above is in addition to continuous reinforcement.

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 MASONRY INSTALLATION

A. Placing Reinforcement: Comply with requirements of ACI 530.1/ASCE 6/TMS 602 and General Structural Notes or Drawings.

B. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
   1. Comply with requirements of ACI 530.1/ASCE 6/TMS 602 and General Structural Notes or Drawings for cleanouts and for grout placement, including minimum grout space and maximum pour height.

3.8 CONSTRUCTION TOLERANCES

A. Comply with the following tolerances:
   1. Standard and Economy Level of Quality (locations not exposed to Public view in final construction):
      a. External corners and other conspicuous lines and levels: +/- 1/2 inch in any 10’-0” section.
      b. Line of sealant filled movement joints (allowable deviation from specified or indicated): +/- 1/2 inch in any 10’-0” section.
      c. Actual cross sectional dimension of columns and walls (allowable deviation from specified or indicated): - 3/8 inch, + 3/4 inch.
      d. Adjacent unit faces in plane (allowable deviation from specified or indicated): +/- 3/16 inch.
      e. Mortar bed joint thickness (allowable deviation from specified or indicated): -1/8 inch, +1/4 inch.
      f. Mortar head joint thickness (allowable deviation from specified or indicated): - 1/4 inch, + 3/8 inch.
      g. Vertical alignment of the centerline of corresponding head joints in alternate courses when using other than stack bond (allowable deviation from specified or indicated): +/- 5/8 inch.
      h. Vertical alignment of the centerline of all head joints in a total wall height not to exceed 30’-0” when using other than stack bond (allowable deviation from specified or indicated): +/- 2 inches.

i. Vertical alignment of the centerline of all head joints in total wall height not to exceed 30’-0” when using stack bond: (allowable deviation from specified or indicated): +/- one inch.

2. Custom Level of Quality (exposed locations):
   a. External corners and other conspicuous lines and levels: +/- 1/4 inch in any 10’-0” section.
   b. Line of sealant filled movement joints (allowable deviation from specified or indicated): +/- 3/8 inch in any 10’-0” section.
   c. Actual cross sectional dimension of columns and walls (allowable deviation from specified or indicated): - 1/4 inch, + 1/2 inch.
   d. Adjacent unit faces in plane (allowable deviation from specified or indicated): +/- 1/8 inch.
   e. Mortar bed joint thickness (allowable deviation from specified or indicated): -1/8 inch, +1/8 inch.
   f. Mortar head joint thickness (allowable deviation from specified or indicated): - 1/8 inch, + 1/4 inch.
   g. Vertical alignment of the centerline of corresponding head joints in alternate courses when using other than stack bond (allowable deviation from specified or indicated): +/- 3/8 inch.
   h. Vertical alignment of the centerline of all head joints in a total wall height not to exceed 30’-0” when using other than stack bond (allowable deviation from specified or indicated): +/- one inch.
   i. Vertical alignment of the centerline of all head joints in total wall height not to exceed 30’-0” when using stack bond: (allowable deviation from specified or indicated): +/- 1/2 inch.

3.9 REPAIRING, POINTING, AND MASONRY CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

3.10 CLEANING

A. Remove scaffolding and equipment used in Work.

B. Clean up debris, refuse and surplus material and remove from premises.

3.11 PROTECTION

A. Furnish temporary protection for exposed masonry corners subject to injury.

B. Carefully cover tops of walls left incomplete at conclusion of day's Work with tarpaulins or other approved covering.

C. In hot and dry weather, protect masonry against too rapid drying.

D. Protect finished Work against freezing for a period of not less than 48 hours by means of enclosures, artificial heat, or such other protective methods as may be required.

END OF SECTION

SECTION 04 21 13

BRICK MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Face Brick – Clay Masonry Units.
2. Mortar.
3. Reinforcement.
4. Flashing material.
5. Accessories.

B. Related Sections:

1. Division 04 Section "Unit Masonry".
2. Division 06 Section “Sheathing”.
3. Division 07 Section “Weather Barriers”.
4. Division 07 Section “Sheet Metal Flashing and Trim’.

1.3 SUBMITTALS

A. Reference Section 01 33 00–Submittal Procedures; submit following items:

1. Product Data.
2. Samples:

a. Standard sample board consisting of small-scale pieces of veneer units showing full range of textures and colors.

3. Quality Assurance/Control Submittals:

a. Regulatory Requirements: Evaluation reports.
b. Veneer manufacturer’s installation instructions.
c. Installation instructions for other materials.

1.4 QUALITY ASSURANCE

A. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

1.5 PROJECT CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

2.2 FACE BRICK – CLAY MASONRY UNITS

A. General: Provide shapes indicated and as follows.

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Basis-of-Design Face Brick Manufacturer and Color: **Acme Brick - Denton Plant, Mocha Ironspot Blend DTP602, Velour Texture.**

1. Alternate Manufacturers and Colors:

a. Acme Brick Company – Crockets Bluff.
b. Bilco Corporation – Brentwood.

C. Brick Specifications:

1. ASTM C 216.
2. Grade: SW.

3. Type: FBX.
4. Initial Rate of Absorption: Less than 20 g/30 sq. in. per minute when tested per ASTM C 67.
5. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
6. Size (Actual Dimensions): Modular, 3-5/8" inches wide by 2-13/16 inches high by 7-5/8 inches long.

2.3 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type I. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Masonry Cement: ASTM C 91.

D. Aggregate for Mortar: Sand, ASTM C 144.

E. Water: Potable.

F. Mortar should be mixed by proportion according to ASTM C 270 for Type N mortar.

2.4 REINFORCEMENT

A. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.

2.5 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.

B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

C. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire.
2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.187-inch- diameter, hot-dip galvanized steel wire.

D. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.060-inch- thick, steel sheet, galvanized after fabrication.
2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.187-inch- diameter, hot-dip galvanized steel wire.
3. Corrugated Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from 0.060-inch- thick, steel sheet, galvanized after fabrication with dovetail tabs for inserting into dovetail slots in concrete and sized to extend to within 1 inch of masonry face.

DI. Adjustable Masonry-Veneer Anchors:

1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:

a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.

2.6 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:

1. Metal Drip Edge: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees.
2. Metal Sealant Stop: Fabricate from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 1/4 inch to form a stop for retaining sealant backer rod.

B. Flexible Flashing: Use one of the following unless otherwise indicated:

1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.030 inch.

2. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy.

3. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D 4637, 0.040 inch thick.

C. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; formulated from neoprene.

B. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

C. Weep/Vent Products: Use one of the following unless otherwise indicated:

1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.

2. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.

3. Vinyl Weep Hole/Vent: One-piece, offset, T-shaped units made from flexible PVC, designed to fit into a head joint and consisting of a louvered vertical leg, flexible wings to seal against ends of masonry units, and a top flap to keep mortar out of the head joint; in color selected by Architect.

CI. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Provide one of the following configurations:

a. Strips, full-depth of cavity and 10 inches high, with dovetail shaped notches 7 inches deep.
b. Strips, not less than 3/4 inch thick and 10 inches high, with dimpled surface designed to catch mortar droppings and prevent weep holes from clogging with mortar.
c. Sheets or strips full depth of cavity and installed to full height of cavity.

2.8 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.9 MORTAR MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar.
2. Use portland cement-lime mortar unless otherwise indicated.
3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide Type N unless another type is indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

3.2 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation do not vary by more than plus 1/4 inch or minus 1/4 inch.
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.

2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch; do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
2. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.

3.3 LAYING MASONRY WALLS

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

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in **flimish bond**; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

A. Lay hollow brick as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With entire units, including areas under cells, fully bedded in mortar at starting course on footings.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.5 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:

1. Provide an open space not less than 1/2 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.6 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to wall framing with masonry-veneer anchors to comply with the following requirements:

1. Fasten screw-attached anchors through sheathing to wall framing with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
2. Embed tie sections in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 32 inches o.c. horizontally with not less than 1 anchor for each 3.5 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

3.7 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.

3. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
4. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal flashing termination.

C. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

1. Use specified weep/vent products to form weep holes.
2. Space weep holes 24 inches o.c. unless otherwise indicated.

CI. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

CII. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.8 CLEANING

A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes
2. Protect adjacent surfaces from contact with cleaner.
3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
4. Clean brick by bucket-and-brush hand-cleaning method described in "BIA Technical Notes 20."

3.9 MASONRY WASTE DISPOSAL

A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Do not dispose of masonry waste as fill within 18 inches of finished grade.

B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 21 13

SECTION 04 58 20

STONE VENEER ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes stone veneer in the following applications:

1. On concrete retaining walls.
2. Anchored to concrete backup.
3. Anchored to stud framing and sheathing.

B. Products installed, but not furnished, in this Section include steel lintels and shelf angles for stone veneer assemblies specified in Division 5 Section "Metal Fabrications."

1.2 SUBMITTALS

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

1. For stone varieties proposed for use on Project, include data on physical properties specified.

B. Stone Samples: For each color, grade, finish, and variety of stone required.

C. Colored Mortar Samples: For each color required.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An installer who employs experienced stone masons and stone fitters who are skilled in installing stone veneer assemblies similar in material, design, and extent to those indicated for this Project and whose projects have a record of successful in-service performance.

B. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.

1. Build mockups for each type of stone veneer assembly in sizes approximately 48 inches long by 48 inches high by full thickness, including face and backup.

1.4 PROJECT CONDITIONS

A. Protection of Stone Veneer Assemblies: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work.

B. Stain Prevention: Immediately remove mortar and soil to prevent them from staining the face of stone veneer assemblies.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried.

D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 STONE SOURCES

A. Varieties and Sources: Subject to compliance with requirements, provide one of the following stone varieties from one of the following sources:

B. Varieties and Sources: Subject to compliance with requirements, provide stone of the following variety and from the following source:

1. Stone Type, Antique Lueders, (coordinate final selection with Architect)

2.2 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.

2.3 STONE

A. Limestone Building Stone Standard: ASTM C 568, classification as follows:

1. Classification: II (Medium-Density).

2.4 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.

B. Hydrated Lime: ASTM C 207, Type S.

C. Masonry Cement: ASTM C 91.

D. For pigmented mortar, use a colored cement formulation as required to produce color indicated or, if not indicated, as selected from manufacturer's standard formulations.

1. Products:

a. Colored Portland Cement-Lime Mix:

1) Blue Circle Cement; Eaglebond.
2) Glen-Gery Corporation; Color Mortar Blend.
3) Holnam, Inc.; Rainbow Mortamix Custom Color Cement/Lime.
4) Lafarge Corporation; Centurion Colorbond PL.
5) Lehigh Portland Cement Co.; Lehigh Custom Color Portland/Lime.
6) Riverton Corporation (The); Riverton Portland Cement Lime Custom Color.

b. Colored Masonry Cement:

1) Blue Circle Cement; Magnolia Masonry Cement.
2) Essroc Materials, Inc.; Brixment-in-Color.
3) Holnam, Inc.; Rainbow Mortamix Custom Color Masonry Cement.
4) Lafarge Corporation; Centurion Colorbond.
5) Lehigh Portland Cement Co.; Lehigh Custom Color Masonry Cement.
6) National Cement Company, Inc.; Coosa Masonry Cement.
7) Riverton Corporation (The); Flamingo Color Masonry Cement.
8) Southdown, Inc.; Richcolor Masonry Cement.

E. Aggregate: ASTM C 144 and as follows:

1. For pointing mortar, use aggregate graded with 100 percent passing No. 16 sieve.
2. White Aggregates: Natural white sand or ground white stone.
3. Colored Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.

F. Mortar Pigments: Natural or synthetic iron oxides, compounded for use in mortar mixes and with a record of satisfactory performance in stone masonry mortars.

1. Products:

a. Bayer Corporation, Industrial Chemicals Div.; Bayferrox Iron Oxide Pigments.
b. Davis Colors; True Tone Mortar Colors.
c. Lafarge Corporation; Centurion Pigments.
d. Solomon Colors; SGS Mortar Colors.

G. Water: Potable.

2.5 VENEER ANCHORS

A. Materials:

1. Hot-Dip Galvanized Steel Wire: ASTM A 82, with ASTM A 153/A 153M, Class B-2.
2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
3. Hot-Dip Galvanized Steel Sheet: ASTM A 366/A 366M, cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M, Class B-2.
4. Stainless-Steel Sheet: ASTM A 666, Type 304.

B. Adjustable Veneer Anchors: 2-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to wall, for attachment over sheathing to wood or metal studs, and that are capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.

1. Screw-Attached Veneer Anchors: Units with triangular wire tie and rib-stiffened, sheet metal anchor section with screw holes top and bottom and with raised rib-stiffened strap stamped into center to provide a slot for connection of wire tie.

a. Products:

1) Dur-O-Wal, a Dayton Superior Company; D/A 213.
2) Heckmann Building Products, Inc.; 315-D with 316.
3) Hohmann & Barnard, Inc.; DW-10.
4) Masonry Reinforcing Corporation of America; 1004, Type III.

2. Seismic Veneer Anchors: Units with rib-stiffened, sheet metal anchor section with screw holes top and bottom and with raised rib-stiffened strap stamped into center to provide a slot for a connector section designed to engage continuous wire embedded in the veneer mortar joint.

a. Products:

1) Dur-O-Wal, a Dayton Superior Company; D/A 213S.
2) Hohmann & Barnard, Inc.; DW-10-X-Seismiclip.
3) Masonry Reinforcing Corporation of America; RJ-711 with Wire-Bond Clip.

2.6 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Fabricate from the following metal complying with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim" and below:

1. Material: Stainless steel, 0.0156 inch thick.

B. Contractor's Option for Concealed Flashing: For flashing partly exposed to the exterior, use metal flashing specified above. For flashing not exposed to the exterior, use one of the following, unless otherwise indicated:

1. Copper-Laminated Flashing: 5-oz./sq. ft. sheet copper bonded with asphalt between 2 layers of glass-fiber cloth.

a. Products:

1) Advanced Building Products, Inc.; Copper Fabric Flashing.
2) AFCO Products, Inc.; Copper Fabric.
3) Hohmann & Barnard, Inc.; H & B C-Fab Flashing.
4) Phoenix Building Products; Type FCC-Fabric Covered Copper.
5) Polytite Manufacturing Corp.; Copper Fabric Flashing.
6) Sandell Manufacturing Co., Inc.; Copper Fabric Flashing.
7) York Manufacturing, Inc.; York Copper Fabric Flashing.

2. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable and highly adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of 0.030 inch.

    a. Products:

        1) Dur-O-Wal, a Dayton Superior Company; Dur-O-Barrier.
        2) Grace, W. R. & Co., Construction Products Division; Perm-A-Barrier Wall Flashing.
        3) Hohmann & Barnard, Inc.; Textroflash.
        4) Polyguard Products, Inc.; Polyguard 300.
        5) Polytite Manufacturing Corp.; Poly-Barrier Self-Adhering Wall Flashing.
        6) Williams Products, Inc.; Everlastic MF-40.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

A. Dampproofing for Limestone: Cementitious formulations that are recommended by ILI and that are nonstaining to stone, compatible with joint sealants, and noncorrosive to veneer anchors and attachments.

B. Asphalt Dampproofing for Concrete Backup: Cut-back asphalt complying with ASTM D 4479, Type I, or asphalt emulsion complying with ASTM D 1227, Type III or IV.

C. Weep Holes:

1. Round Plastic Tubing: Medium-density polyethylene, 3/8-inch OD by thickness of stone veneer assembly.
2. Wicking Material: Cotton or polyester rope, 1/4 to 3/8 inch in diameter, in length required to produce 2-inch exposure on exterior and 18 inches in cavity behind stone veneer assembly.

D. Cavity Drainage Material: 1-inch thick, free-draining mesh made from polyethylene strands.

1. Products:

    a. Advanced Building Products, Inc.; Mortar Break.
    b. CavClear; CavClear Masonry Mat.
    c. Mortar Net USA, Ltd.; Mortar Net.
    d. Polytite Manufacturing Corp.; Mortar Stop.

2.8 MASONRY CLEANERS

A. Job-Mixed Detergent Solution: Solution of 1/2-cup dry-measure tetrasodium polyphosphate and 1/2-cup (0.14-L) dry-measure laundry detergent dissolved in 1 gal. of water.

B. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from stone masonry surfaces without discoloring or damaging masonry surfaces; expressly approved for intended use by stone producer.

1. Products:

a. Diedrich Technologies, Inc.; 101G Granite, Terra Cotta, and Brick Cleaner.
b. Diedrich Technologies, Inc.; 202 New Masonry Detergent.
c. Dominion Restoration, Inc.; DR-60 Stone and Masonry Cleaner.
d. Hydrochemical Techniques, Inc.; Hydroclean Brick, Granite, Sandstone and Terra Cotta Cleaner (HT-626).
e. ProSoCo, Inc.; Sure Klean No. 600 Detergent.
f. ProSoCo, Inc.; Sure Klean Restoration Cleaner.

2.9 STONE FABRICATION

A. General: Fabricate stone in sizes and shapes necessary to comply with requirements indicated, including details on Drawings.

B. Gage backs of stones for adhered veneer if more than 81 sq. in. in area.

C. Shape stone for type of masonry (pattern) as follows:

1. Split-bed, random-range ashlar with random course heights and random lengths (interrupted coursed).

D. Finish exposed faces and edges of stone to comply with requirements indicated for finish and to match approved samples and mockups.

1. Finish: Cut face, refined & split face, RE: Elevations
2. Finish for Sills: Smooth, machine.
3. Finish for Lintels: Smooth, machine finish.
4. Finish for Copings: Smooth, machine finish.

a. Finish exposed ends of copings same as front and back faces.

2.10 MORTAR MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride.
2. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.

B. Mortar for Stone Masonry: Comply with ASTM C 270, Proportion Specification.

1. Limit cementitious materials in mortar to portland cement, mortar cement, and lime.
2. Mortar for Setting Stone: Type S.
3. Mortar for Pointing Stone: Type N.

C. Latex-Modified Portland Cement Setting Mortar: Proportion and mix portland cement, aggregate, and latex additive to comply with latex-additive manufacturer's written instructions.

D. Cement-Paste Bond Coat: Mix either neat cement and water or cement, sand, and water to a consistency similar to that of thick cream.

1. For latex-modified portland cement setting-bed mortar, substitute latex admixture for part or all of water, according to latex-additive manufacturer's written instructions.

E. Mortar for Scratch Coat over Metal Lath: 1 part portland cement, 1/2 part lime, 5 parts loose damp sand, and enough water to produce a workable consistency.

F. Mortar for Scratch Coat over Unit Masonry: 1 part portland cement, 1 part lime, 7 parts loose damp sand, and enough water to produce a workable consistency.

G. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required.

1. Pigments shall not exceed 10 percent of portland cement by weight.
2. Pigments shall not exceed 5 percent of masonry cement by weight.

PART 3 - EXECUTION

3.1 SETTING OF STONE VENEER, GENERAL

A. Accurately mark stud centerlines on face of building paper or building wrap before beginning stone installation.

B. Coat concrete backup with asphalt dampproofing.

C. Perform necessary field cutting as stone is set. Use power saws to cut stone. Cut lines straight and true, with edges eased slightly to prevent snipping.

D. Arrange stones for good fit in coursed rubble pattern with joint widths within tolerances indicated. Insert small stones into spaces between larger stones as needed to produce joints as uniform in width as practical.

E. Maintain uniform joint widths except for variations due to different stone sizes and where minor variations are required to maintain bond alignment, if any. Lay walls with joints not less than 3/8 inch at narrowest points nor more than 3/8 inch at widest points.

F. Install embedded flashing and weep holes at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

1. At metal stud-framed walls, extend flashing from exterior face of veneer, through the veneer, up the face of sheathing at least 8 inches , and behind building paper or building wrap.
2. At lintels and shelf angles, extend flashing full length of angles but not less than 4 inches into masonry at each end.
3. At heads and sills, extend flashing 4 inches at ends and turn up not less than 2 inches to form a pan.
4. Extend sheet metal flashing 1/2 inch beyond face of masonry at exterior and turn flashing down to form a drip.
5. Install metal drip edges beneath flashing at exterior face of wall. Stop flashing 1/2 inch (back from outside face of wall and adhere flashing to top of metal drip edge.

6. Install metal flashing termination beneath flashing at exterior face of wall. Stop flashing 1/2 inch back from outside face of wall and adhere flashing to top of metal flashing termination.
7. Cut flashing flush with face of wall after masonry wall construction is completed.

G. Coat limestone with dampproofing as follows:

1. Stone at Grade: Beds, joints, and back surfaces to at least 12 inches above finish-grade elevations.
2. Stone Extending below Grade: Beds, joints, back surfaces, and face surfaces below grade.

H. Place weep holes and vents in joints where moisture may accumulate, including at base of cavity walls, above shelf angles, and at flashing.

I.

1. Use wicking material to form weep holes above flashing in stone sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
2. Space weep holes 24 inches o.c.

J. Trim wicking material used in weep holes flush with outside face of wall after mortar has set.

K. Install vents in vertical head joints at the top of each continuous cavity at spacing indicated. Use round plastic tubing or open head joints to form vents.

3.2 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/4 inch in 10 feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet or more.

B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.

C. Variation of Linear Building Line: For position shown in plan, do not exceed 1/2 inch in 20 feet or 3/4 inch in 40 feet or more.

3.3 INSTALLATION OF ANCHORED STONE VENEER ASSEMBLIES

A. Anchor stone veneer to concrete with corrugated-metal veneer anchors as follows:

1. Secure veneer anchors by inserting dovetailed ends into dovetail slots in concrete.
2. Embed veneer anchors in mortar joints to within 1 inch of face.

B. Anchor stone veneer to unit masonry with metal veneer anchors as follows:

1. Embed corrugated-metal anchors in unit masonry mortar joints or grouted cells for distance at least one-half of veneer thickness.
2. Secure wire anchors by inserting pintles into eyes of masonry wall reinforcement projecting from horizontal mortar joints.
3. Secure triangular wire anchors with vertical rods inserted through anchors and through eyes of masonry wall reinforcement projecting from horizontal mortar joints.

4. Embed anchors in veneer mortar joints to within 1 inch of face.

C. Anchor stone veneer to framing with adjustable, screw-attached veneer anchors as follows:

1. Fasten each anchor section through sheathing to framing with two screws.
2. Embed wire tie section in mortar joints to within 1-1/2 inches of face.

D. Space veneer anchors not more than 18 inches o.c. vertically and 32 inches o.c. horizontally, with not less than 1 veneer anchor per 2.67 sq. ft. of wall area. Install additional veneer anchors within 12 inches of openings, sealant joints, and perimeter at intervals not exceeding 12 inches.

E. Set stone in full bed of mortar with full head joints, unless otherwise indicated. Build veneer anchors into mortar joints as stone is set.

1. Install continuous wire reinforcement in horizontal joints indicated and attach to seismic veneer anchors as stone is set.

F. Provide 1-inch air space between stone veneer assemblies and backup construction, unless otherwise indicated. Keep air space free of mortar droppings and debris.

1. Place mortar spots in cavity at veneer anchors to maintain spacing.
2. Slope beds toward air space to minimize mortar protrusions into air space. As work progresses, trowel mortar fins protruding into air space flat against back of veneer.

G. Rake out joints for pointing with mortar to depth of not less than 1/2 inch. Rake joints to uniform depths with square bottoms and clean sides.

3.4 POINTING

A. Prepare stone-joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply pointing mortar in layers not more than 3/8 inch deep until a uniform depth is formed.

B. Point stone joints by placing and compacting pointing mortar in layers not more than 3/8 inch deep. Compact each layer thoroughly and allow to become thumbprint hard before applying next layer.

C. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile:

1. Joint Profile: Rake Joint (simulated dry stack appearance)

3.5 ADJUSTING AND CLEANING

A. In-Progress Cleaning: Clean stone veneer assemblies as work progresses. Remove mortar fins and smears before tooling joints.

B. Final Cleaning: After mortar is thoroughly set and cured, clean stone veneer assemblies as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

2. Test cleaning methods on mockup; leave one-half of panel uncleaned for comparison purposes.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner.
4. Wet wall surfaces with water before applying cleaner; remove cleaner promptly by rinsing thoroughly with clear water.
5. Clean stone veneer assemblies by bucket and brush hand-cleaning method described in BIA Technical Note No. 20 Revised II, using job-mixed detergent solution.
6. Clean stone veneer assemblies with proprietary acidic cleaner applied according to manufacturer's written instructions.
7. Clean limestone veneer assemblies to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.6 EXCESS MATERIALS AND WASTE

A. Disposal as Fill Material: Dispose of clean masonry waste, including mortar and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.

1. Do not dispose of masonry waste as fill within 18 inches of finished grade.

END OF SECTION 04 58 20

SECTION 05 12 00

STRUCTURAL STEEL FRAMING

SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel.
2. Grout.

B. Related Requirements:

1. Section 051213 "Architecturally Exposed Structural Steel Framing" for additional requirements for architecturally exposed structural steel.

1.2 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show fabrication of structural-steel components.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Mill test reports for structural steel, including chemical and physical properties.

D. Source quality-control reports.

E. Field quality-control and special inspection reports.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.
2. AISC 360.
3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using schematic details indicated and AISC 360.
2. Use Allowable Stress Design; data are given at service-load level.

B. Moment Connections: Type PR, partially restrained.

C. Construction: Braced frame.

2.2 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992/A 992M.

B. Channels, Angles: ASTM A 36/A 36M.

C. Plate and Bar: ASTM A 36/A 36M

D. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade B, structural tubing.

E. Steel Pipe: ASTM A 53/A 53M, Type E or Type S, Grade B.

F. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.

B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 490, compressible-washer type with plain finish.

C. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.

1. Finish: Hot-dip zinc coating.
2. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with mechanically deposited zinc coating finish.

D. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish: Plain.

E. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

F. Unheaded Anchor Rods: ASTM F 1554, Grade 36.

1. Configuration: Straight.
2. Finish: Plain.

G. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.

1. Finish: Plain.

H. Threaded Rods: ASTM A 36/A 36M.

1. Finish: Plain.

I. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.

2.4 PRIMER

A. Primer: Comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

B. Primer: SSPC-Paint 25, Type I, zinc oxide, alkyd, linseed oil primer.

C. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

2.5 GROUT

A. Metallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.

B. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

2.7 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.8 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces of high-strength bolted, slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.
6. Surfaces enclosed in interior construction.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."
3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform shop tests and inspections.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Bolted Connections: Inspect shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Baseplates Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

3.3 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Bolted Connections: Inspect bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.

1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E 165.
b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
c. Ultrasonic Inspection: ASTM E 164.
d. Radiographic Inspection: ASTM E 94.

END OF SECTION 05 12 00

SECTION 05 21 00 - STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. K-series steel joists.
2. K-series steel joist substitutes.
3. LH- and DLH-series long-span steel joists.
4. Joist girders.
5. Joist accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of joist, accessory, and product.

B. Shop Drawings:

1. Include layout, designation, number, type, location, and spacing of joists.
2. Include joining and anchorage details; bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Manufacturer certificates.

C. Mill Certificates: For each type of bolt.

D. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."

1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 K-SERIES STEEL JOISTS

A. Manufacture steel joists of type indicated according to "Standard Specification for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.

B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.

2.2 LONG-SPAN STEEL JOISTS

A. Manufacture steel joists according to "Standard Specification for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as indicated.

2.3 JOIST GIRDERS

A. Manufacture joist girders according to "Standard Specification for Joist Girders" in SJI's "Specifications," with steel-angle top- and bottom-chord members; with end and top-chord arrangements as indicated.

2.4 PRIMERS

A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

B. Primer: Provide shop primer that complies with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

2.5 JOIST ACCESSORIES

A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.

B. Bridging: Schematically indicated. Detail and fabricate according to SJI's "Specifications." Furnish additional erection bridging if required for stability.

C. Bridging: Fabricate as indicated and according to SJI's Specifications. Furnish additional erection bridging if required for stability.

D. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface unless otherwise indicated.

E. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

1. Finish: Plain.

F. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.6 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories.

B. Apply one coat of shop primer to joists and joist accessories.

C. Shop priming of joists and joist accessories is specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written instructions, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.

C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Bolt joists to supporting steel framework using carbon-steel bolts.

E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.

F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Visually inspect field welds according to AWS D1.1/D1.1M.

C. Visually inspect bolted connections.

D. Prepare test and inspection reports.

END OF SECTION 05 21 00

SECTION 05 31 00

STEEL DECKING

SECTION 05 31 00 - STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof deck.
2. Composite floor deck.
3. Noncomposite form deck.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Evaluation reports.

D. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

2.2 ROOF DECK

A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.

    a. Color: Manufacturer's standard.

2. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
3. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.

    a. Color: Manufacturer's standard.

4. Deck Profile: As indicated.
5. Profile Depth: 1-1/2 inches.
6. Design Uncoated-Steel Thickness: As indicated.

2.3 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

G. Galvanizing Repair Paint: ASTM A 780/A 780M.

H. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

C. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

D. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

E. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

F. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

G. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld or mechanically fasten flanges to top of deck. Space welds or mechanical fasteners not more than 12 inches apart with at least one weld or fastener at each corner.

1. Install reinforcing channels or zees in ribs to span between supports and weld or mechanically fasten.

H. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

I. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

J. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Prepare test and inspection reports.

3.3 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.

END OF SECTION 05 31 00

SECTION 05 40 00

COLD-FORMED METAL FRAMING

SECTION 05 40 00 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Load-bearing wall framing.
2. Exterior non-load-bearing wall framing.
3. Interior non-load-bearing wall framing exceeding height limitations of standard, nonstructural metal framing.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product certificates.

C. Product test reports.

D. Evaluation Reports: For post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified independent testing agency.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

D. Comply with AISI S230 "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:

1. Wall Studs: AISI S211.
2. Headers: AISI S212.
3. Lateral Design: AISI S213.

B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.2 COLD-FORMED STEEL FRAMING MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:

1. Grade: ST33H.
2. Coating: G60, A60, AZ50, or GF30.

B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: 33.
2. Coating: G60.

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Base-Metal Thickness: 0.0428 inch minimum.
2. Flange Width: 1-5/8 inches minimum
3. Section Properties: As indicated.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and matching minimum base-metal thickness of steel studs.

C. Vertical Deflection Clips: Manufacturer's standard head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure.

E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.4 INTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Base-Metal Thickness: 0.0329 inch minimum.
2. Flange Width: 1-3/8 inches minimum
3. Section Properties: As indicated.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and matching minimum base-metal thickness of steel studs.

C. Vertical Deflection Clips: Manufacturer's standard head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure.

E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.5 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated.

2.6 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts, carbon-steel nuts, and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 as appropriate for the substrate.

1. Uses: Securing cold-formed steel framing to structure.
2. Type: Adhesive anchor.
3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
4. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

D. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780/A 780M.

B. Cement Grout: Portland cement, ASTM C 150/C 150M, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C 1107/C 1107M, and with a fluid consistency and 30-minute working time.

D. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that required to obtain fire-resistance ratings indicated. Protect remaining fire-resistive materials from damage.

C. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.2 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.

C. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

D. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

E. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

F. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

G. Install insulation, specified in Section 072100 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

H. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

I.

3.3 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:

1. Stud Spacing: As indicated on Drawings.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single deep-leg deflection tracks and anchor to building structure.
2. Install double deep-leg deflection tracks and anchor outer track to building structure.
3. Connect vertical deflection clips to infill studs and anchor to building structure.
4. Connect drift clips to cold-formed steel framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.

1. Install solid blocking at centers indicated on Shop Drawings.

G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.4 INTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:

1. Stud Spacing: As indicated on Drawings.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single deep-leg deflection tracks and anchor to building structure.
2. Install double deep-leg deflection tracks and anchor outer track to building structure.
3. Connect vertical deflection clips to studs and anchor to building structure.
4. Connect drift clips to cold-formed steel metal framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.

1. Install solid blocking at centers indicated on Shop Drawings.

G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 ERECTION TOLERANCES

A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.6 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

END OF SECTION 05 40 00

SECTION 05 52 00

PIPE AND TUBE RAILINGS

SECTION 05 52 00 – PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Steel pipe handrails and railings.

1.2 DEFINITIONS

A. Definitions in ASTM E 985 for railing-related terms apply to this section.

1.3 PERFORMANCE REQUIREMENTS

A. General: In engineering handrails and railings to withstand structural loads indicated, determine allowable design working stresses of handrail and railing materials based on the following:
   1. Steel: 72 percent of minimum yield strength.

B. Structural Performance of Handrails and Railings: Provide handrails and railings complying with requirements of ASTM E 985 for structural performance, based on testing performed according to ASTM E 894 and ASTM E 935.

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

D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

A. Product Data: For the following:
   1. Manufacturer's product lines of mechanically connected handrails and railings.
   2. Grout, anchoring cement, and paint products.

B. Shop Drawings: Show fabrication and installation of handrails and railings. Include plans, elevations, sections, component details, and attachments to other Work. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other sections.
   1. For installed handrails and railings indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Verification: For each type of exposed finish required, prepared on components indicated below and of same thickness and metal indicated for the Work. If finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.

1. 6-inch long sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
2. Fittings and brackets.
3. Assembled sample of stainless steel railing system, made from full-size components, including top rail, post, handrail, and infill. Show method of finishing members at intersections. Sample need not be full height.

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

F. Product Test Reports: From a qualified testing agency indicating handrails and railings comply with ASTM E 985, based on comprehensive testing of current products.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

B. Source Limitations: Obtain each type of handrail and railing through one source from a single manufacturer.

1.6 STORAGE

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

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify handrail and railing dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.8 COORDINATION

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

1.9 SCHEDULING

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Steel Pipe and Tube Railings:
   a. Pisor Industries, Inc.
   b. Sharpe Products.
   c. Humane Equipment Co.
   d. Wagner: R & B Wagner, Inc.

2.2 STEEL AND IRON

A. General: Provide metal free from pitting, seam marks, roller marks, stains, discolorations, and other imperfections where exposed to view on finished units.

B. Steel and Iron: Provide steel and iron in the form indicated, complying with the following requirements:
   1. Steel Pipe: ASTM A 53; finish, type, and weight class as follows:
      a. Black finish, unless otherwise indicated.
      b. Galvanized finish for exterior installations and where indicated.
      c. Type S, Grade A, standard weight (Schedule 40), unless another grade and weight are required by structural loads.
   2. Steel Tubing: Cold-formed steel tubing, ASTM A 500, Grade A, unless another grade is required by structural loads.
   3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

D. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.3 WELDING MATERIALS, FASTENERS, AND ANCHORS

A. Welding Electrodes and Filler Metal: Select according to AWS specifications for metal alloy welded. Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Fasteners: Provide the following:
   1. Steel Railings: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
   2. Aluminum Railings: Type 304 stainless-steel fasteners.

C. Fasteners for Anchoring Handrails and Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring handrails and railings to other types of construction indicated and capable of withstanding design loads.

D. Fasteners for Interconnecting Handrail and Railing Components: Use fasteners fabricated from same basic metal as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.
   1. Provide concealed fasteners for interconnecting handrail and railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for handrails and railings indicated.
   2. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.

E. Cast-in-Place and Postinstalled Anchors: Anchors of type indicated below, fabricated from

corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Cast-in-place anchors.
2. Expansion anchors.

2.6 PAINT

A. Shop Primer for Ferrous Metal: Manufacturer's or fabricator's standard fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

B. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

C. Zinc Chromate Primer: FS TT-P-645

2.7 GROUT AND ANCHORING CEMENT

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

B. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.8 FABRICATION

A. General: Fabricate handrails and railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Assemble handrails and railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Form changes in direction of railing members as follows:
   1. By radius bends.

D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

E. Interconnect members by butt-welding or welding with internal connectors, at fabricator's option,

unless otherwise indicated.

1. At tee and cross intersections, cope ends of intersecting members to fit contour of pipe to which end is joined, and weld all around.

F. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing members to other work, unless otherwise indicated.

G. Provide inserts and other anchorage devices for connecting handrails and railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.

H. For railing posts set in concrete, provide preset sleeves of steel not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, and steel plate forming bottom closure.

I. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.

J. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.

K. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.

L. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members that are exposed to exterior or to moisture from condensation or other sources.

M. Fabricate joints that will be exposed to weather in a watertight manner.

N. Close exposed ends of handrail and railing members by welding 3/16 inch thick steel plate in place or by use of prefabricated end fittings.

O. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of railing and wall is 1/4 inch or less.

P. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.9 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.10 STEEL FINISHES

A. Galvanizing: For all items at exterior locations or exposed to weather conditions, apply zinc coating by the hot-dip process complying with the following requirements:

1. ASTM A 153 for galvanizing iron and steel hardware.

2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick or thicker.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed handrails and railings:
1. Exteriors (SSPC Zone 1B): SSPC-SP 6, "Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP 7, "Brush-off Blast Cleaning."

C. Apply shop primer to prepared surfaces of handrail and railing components, unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION, GENERAL

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

B. Perform cutting, drilling, and fitting required to install handrails and railings. Set handrails and railings accurately in location, alignment, and elevation; measured from established lines and levels and free from rack.
1. Do not weld, cut, or abrade surfaces of handrail and railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
3. Align rails so variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

C. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

D. Adjust handrails and railings before anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated, but not less than that required by structural loads.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

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

3.4 ANCHORING POSTS

A. Unless indicated for anchoring into concrete with metal base plates with expansion anchors, Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's written instructions:
   1. Nonshrink, nonmetallic grout.

B. Cover anchorage joint with flange of same metal as post, attached to post as follows:
   1. Welded to post after placing anchoring material.

C. Leave anchorage joint exposed; wipe off surplus anchoring material; and leave 1/8-inch build-up, sloped away from post.

D. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
   1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.
   2. For aluminum pipe railings, attach posts using fittings designed and engineered for this purpose.

3.5 ANCHORING RAILING ENDS

A. Anchor railing ends into concrete and masonry with round flanges connected to railing ends and anchored into wall construction with postinstalled anchors and bolts.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces.
   1. Weld flanges to railing ends.

3.6 ATTACHING HANDRAILS TO WALLS

A. Attach handrails to wall with wall brackets. Provide bracket with 1-1/2 inch clearance from inside face of handrail and finished wall surface.

B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets to building construction as follows:
   1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
   2. For hollow masonry anchorage, use toggle bolts.
   3. For steel-framed gypsum board or plaster assemblies, fasten brackets directly to steel framing or concealed steel reinforcements using self-tapping screws of size and type required to support structural loads.

3.7 CLEANING

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

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

C. Clean aluminum by washing thoroughly with clean water and soap and rinsing with clean water.

3.8 PROTECTION

A. Protect finishes of handrails and railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 05 52 00

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof-mounted curbs.

B. Preservative treated wood materials.

C. Communications and electrical room mounting boards.

D. Concealed wood blocking, nailers, and supports.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Setting anchors in masonry.

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.

C. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

E. AWPA U1 - Use Category System: User Specification for Treated Wood; American Wood Protection Association; 2012.

F. PS 1 - Structural Plywood; 2009.

G. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; National Institute of Standards and Technology, U.S. Department of Commerce; 2010.

H. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology, Department of Commerce; 2010.

I. SPIB (GR) - Grading Rules; Southern Pine Inspection Bureau, Inc.; 2014.

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. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

1.06 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. Species: Southern Pine, unless otherwise indicated.
   2. 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.
   3. 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.

B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: Southern Pine Inspection Bureau, Inc. (SPIB).

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: S-dry or MC19.

D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

A. Roof Sheathing: Any PS 2 type, rated Structural I Sheathing.
   1. Bond Classification: Exterior.
   2. Span Rating: 60.
   3. Performance Category: 3/4 PERF CAT.

B. Wall Sheathing: Glass mat faced gypsum, ASTM C1177/C1177M, 5/8 inch Type X fire resistant.
   1. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   2. Edges: Square.
   3. Glass Mat Faced Products:
      a. CertainTeed Corporation; GlasRoc Brand: www.certainteed.com.
      b. Georgia-Pacific Gypsum; DensGlass Sheathing: www.gpgypsum.com.
      c. Substitutions: See Section 01 6000 - Product Requirements.

C. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

D. Other Applications:
   1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
   2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
   3. Other Locations: PS 1, C-D Plugged or better.

2.04 ACCESSORIES

A. Fasteners and Anchors:

1. Metal and Finish: Hot-dipped galvanized steel per ASTM A 153/A 153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.
3. Anchors: Toggle bolt type for anchorage to hollow masonry.

2.05 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 Treatment:

1. Manufacturers:
   a. Arch Wood Protection, Inc: www.wolmanizedwood.com.
   b. Viance, LLC: www.treatedwood.com.
   c. Substitutions: See Section 01 6000 - Product Requirements.
2. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative to 0.25 lb/cu ft retention.
   a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
   b. Treat lumber exposed to weather.
   c. Treat lumber in contact with roofing, flashing, or waterproofing.
   d. Treat lumber in contact with masonry or concrete.
3. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative to 0.25 lb/cu ft retention.
   a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
   b. Treat plywood in contact with roofing, flashing, or waterproofing.
   c. Treat plywood in contact with masonry or concrete.

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate installation of rough carpentry members specified in other sections.

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 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 metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

D. 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.

E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

F. Provide the following specific non-structural framing and blocking:

1. Cabinets and shelf supports.
2. Wall brackets.
3. Handrails.
4. Grab bars.
5. Towel and bath accessories.
6. Wall-mounted door stops.
7. Chalkboards and marker boards.
8. Wall paneling and trim.
9. Joints of rigid wall coverings that occur between studs.

3.04 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

B. Provide wood curb at all roof openings except where specifically indicated otherwise. Form corners by alternating lapping side members.

3.05 INSTALLATION OF CONSTRUCTION PANELS

A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.

1. 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. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.

C. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.

1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.

3. Install adjacent boards without gaps.

3.06 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.07 CLEANING

A. Waste Disposal: Comply with the requirements of Section 01 74 19 - 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 06 1000

SECTION 06 20 00

FINISH CARPENTRY (Exterior)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Exterior standing and running trim.
   2. Exterior soffits.

B. Related Sections include the following:
   1. Division 6 Section "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
   2. Division 9 Section "Painting" for priming and back priming of finish carpentry.

1.3 DEFINITIONS

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect materials against weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.

B. Deliver interior finish carpentry only when environmental conditions meet requirements specified for installation areas. If finish carpentry must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

1.6 PROJECT CONDITIONS

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

B. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit work to be performed according to manufacturer's written instructions and warranty requirements and at least one coat of specified finish to be applied without exposure to

rain, snow, or dampness.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Primed Hardboard Trim:
   a. Georgia-Pacific Corp.
   b. Temple-Inland Forest Products Corp.

2.2 EXTERIOR STANDING AND RUNNING TRIM

A. Lumber Trim for Painted Applications: finger-jointed or solid lumber with surfaced (smooth) face and of the following species and grade:
   1. Grade B, RIS.
   2. .

2.3 EXTERIOR SOFFITS

A. T&G Soffits:
   1. Type: Douglas Fir T&G, V-groove
   2. Grade: D or better
   3. Size: 1x6

2.4 MISCELLANEOUS MATERIALS

A. Fasteners for Exterior Finish Carpentry: Provide nails or screws of the following materials, in sufficient length to penetrate minimum of 1-1/2 inches into substrate, unless otherwise recommended by manufacturer:
   1. Hot-dip galvanized steel.

B. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
   1. Where finish carpentry materials are exposed in areas of high humidity, provide fasteners and anchorages with hot-dip galvanized coating complying with ASTM A 153/A 153M.

C. Flashing: Comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim" for flashing materials installed in finish carpentry.
   1. Horizontal Joint Flashing for Siding: Preformed bonderized (paint grip) Z-shaped flashing.

D. Sealants: Comply with requirements in Division 7 Section "Joint Sealants" for materials required for sealing siding work.

2.5 FABRICATION

A. Wood Moisture Content: Comply with requirements of specified inspection agencies and with manufacturer's written recommendations for moisture content of finish carpentry at relative humidity conditions existing during time of fabrication and in installation areas.

B. Back out or kerf backs of the following members, except members with ends exposed in finished work:
   1. Exterior standing and running trim wider than 5 inches.
   2. Interior standing and running trim, except shoe and crown molds.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Before installing finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours, unless longer conditioning is recommended by manufacturer.

C. Prime lumber for exterior applications to be painted, including both faces and edges. Cut to required lengths and prime ends. Comply with requirements in Division 9 Section "Painting."

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
   1. Do not use manufactured units with defective surfaces, sizes, or patterns.

B. Install finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
   1. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
   2. Countersink fasteners, fill surface flush, and sand where face fastening is unavoidable.
   3. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
   4. Install stairs with no more than 3/16-inch variation between adjacent treads and risers

and with no more than 3/8-inch variation between largest and smallest treads and risers within each flight.

5. Coordinate finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.

1. Match color and grain pattern across joints.
2. Install trim after gypsum board joint finishing operations are completed.
3. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.
4. Fit exterior joints to exclude water. Apply flat grain lumber with bark side exposed to weather.

3.5 ADJUSTING

A. Replace finish carpentry that is damaged or does not comply with requirements. Finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.6 CLEANING

A. Clean finish carpentry on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 06400 - INTERIOR ARCHITECTURAL WOODWORK *(06415 Counter Tops Included in this section)*

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes interior woodwork including for the following applications:

1. Standing and running trim.
2. Wood cabinets.
3. Plastic-laminate cabinets.
4. Plastic-laminate countertops.
5. Solid-surfacing-material countertops.
6. Flush wood paneling and wainscots.
7. Frames and jambs.
8. Shop finishing of woodwork.
9. Interior standing and running trim for field-painted finish.
10. Interior board paneling.
11. Shelving and clothes rods.
12. Counter tops (06415)

B. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips, unless concealed within other construction before woodwork installation.

C. Rough carriages for stairs are interior architectural woodwork.

1. See Division 6 Section "Rough Carpentry" for platform framing and other rough framing associated with stairwork.

1.2 SUBMITTALS

A. Product Data: For the following:

1. Cabinet hardware and accessories.
2. Handrail brackets.
3. Finishing materials and processes.

B. Shop Drawings: Include location of each item, plans and elevations, large-scale details, attachment devices, and other components.

C. Samples:

1. Lumber and panel products for transparent finish, for each species and cut, finished on one side and one edge.
2. Lumber and panel products with shop-applied opaque finish, for each finish system and color, with exposed surface finished.
3. Plastic-laminate-clad panel products, for each type, color, pattern, and surface finish.
4. Thermoset decorative-overlay surfaced panel products, for each type, color, pattern, and surface finish.

5. Solid-surfacing materials.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of woodwork.

B. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork, construction, finishes, and other requirements.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Wood for Transparent Finish:

1. Species and Cut: White Oak, rift sawn. (Lobby & Chamber cabinets and wall panels)

B. Wood for Opaque Finish:

1. Species: Any closed-grain hardwood.

C. Wood Products:

1. Hardboard: AHA A135.4.
2. Medium-Density Fiberboard: ANSI A208.2, Grade MD
3. Softwood Plywood: DOC PS 1, Medium Density Overlay.
4. Hardwood Plywood and Face Veneers: HPVA HP-1.

D. Thermoset Decorative Overlay: Particleboard or medium-density fiberboard with surface of thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.

E. Clear Float Glass for Doors: ASTM C 1036, Type I, Class 1, Quality q3, 6 mm thick, unless otherwise indicated.

F. Clear Tempered Float Glass for Doors: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality q3; manufactured by horizontal (roller-hearth) process, with exposed edges seamed before tempering, 6 mm thick, unless otherwise indicated.

G. High-Pressure Decorative Laminate: NEMA LD 3.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Formica Corporation.
    b. International Paper; Decorative Products Div.
    c. Laminart.
    d. Pioneer Plastics Corp.
    e. Westinghouse Electric Corp.; Specialty Products Div.
    f. Wilsonart International; Div. of Premark International, Inc.

H. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ANSI Z124.3, for Type 5 or Type 6 material and performance requirements, without a precoated finish.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

    a. Avonite, Inc.; Avonite.
    b. DuPont Polymers; Corian.
    c. Formica Corporation; Surell.
    d. International Paper, Decorative Products Div.; Fountainhead.
    e. Swan Corporation (The); Swanstone.
    f. Wilsonart International, Div. of Premark International, Inc.; Gibraltar.

2.2 SHELVING AND CLOTHES RODS

A. Shelving: 3/4-inch medium-density fiberboard shelving with 1/16” radiused front edge.

1. Shelf Cleats: 3/4-by-5-1/2-inch boards with holes to receive clothes rods, of same species and grade indicated above for interior lumber trim for opaque finish.
2. Shelf Brackets: Prime-painted formed steel with provision to support clothes rod where rod is indicated.

B. Clothes Rods: 1-1/2-inch- diameter, clear, kiln-dried softwood rods; either Douglas fir or southern pine.

1. Rod Flanges: Clear, kiln-dried Douglas fir or southern pine.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Lumber and Plywood: Materials impregnated with fire-retardant chemical formulations to comply with AWPA C20 (lumber) and AWPA C27 (plywood), Exterior Type or Interior Type A. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Kiln-dry material after treatment.

B. Fire-Retardant Particleboard: Panels made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture with flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.

C. Fire-Retardant Fiberboard: ANSI A208.2 medium-density fiberboard panels made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture with flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.

2.4 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials for a complete installation of architectural woodwork, except for items specified in Division 8 Section "Door Hardware."

B. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard.

C. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, self-closing.

D. Catches: Magnetic, BHMA A156.9, B03141.

E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

F. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, BHMA A156.9, B05091, and rated for the following loads:

1. Box Drawer Slides: 75 lbf
2. File Drawer Slides: 150 lbf
3. Pencil Drawer Slides: 45 lbf

G. Exposed Hardware Finishes: Complying with BHMA A156.18 for BHMA finish number indicated.

1. Oil Rubbed: BHMA 613 for bronze base; BHMA 640 for steel base.
2. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.

2.5 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.

B. Rough Carriages for Stairs: Comply with requirements in Division 6 Section "Rough Carpentry ."Kiln-dry to less than 15 percent moisture content.

C. Handrail Brackets: drilled and tapped for concealed hanger bolt and with support arm for screwing to underside of rail. Sized to provide 1-1/2-inch clearance between handrail and wall.

2.6 FABRICATION

A. General: Complete fabrication to maximum extent possible before shipment to Project site. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.

1. Interior Woodwork Grade: Premium, complying with the referenced quality standard.
2. Shop cut openings to maximum extent possible. Sand edges of cutouts to remove splinters and burrs.
3. Seal edges of openings in countertops with a coat of varnish.
4. Install glass to comply with applicable requirements in Division 8 Section "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.
5. For trim items wider than available lumber, use veneered construction. Do not glue for width.
6. Back-out or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.

7. Assemble casings in plant except where limitations of access to place of installation require field assembly.

B. Wood Cabinets for Transparent Finish:

1. AWI Type of Cabinet Construction: Flush overlay.
2. WIC Door and Drawer Front Style: Flush overlay.
3. Reveal Dimension: 1/4"
4. Grain Matching: Run and match grain vertically for drawer fronts, doors, and fixed panels.
5. Matching of Veneer Leaves: Book match.
6. Veneer Matching within Panel Face: Running match.
7. Semiexposed Surfaces Other Than Drawer Bodies: Compatible species to that indicated for exposed surfaces, stained to match.

    a. Drawer Sides and Backs: Solid-hardwood lumber, stained to match species indicated for exposed surfaces.
    b. Drawer Bottoms: Hardwood plywood.

C. Wood Cabinets for Opaque Finish:

1. AWI Type of Cabinet Construction: Flush overlay.
2. WIC Construction Style: Style Frameless.
3. WIC Door and Drawer Front Style: Flush overlay.
4. Reveal Dimension: 1/4 inch.
5. Species for Exposed Lumber Surfaces: Any closed-grain hardwood.
6. Panel Product for Exposed Surfaces: Medium-density.
7. Semiexposed Surfaces Other Than Drawer Bodies: Match materials indicated for exposed surfaces.

    a. Drawer Sides and Backs: Solid-hardwood lumber.
    b. Drawer Bottoms: Hardwood plywood.

D. Plastic-Laminate Cabinets:

1. AWI Type of Cabinet Construction: Flush overlay.
2. WIC Construction Style: Style Frameless.
3. WIC Door and Drawer Front Style: Flush overlay.
4. Reveal Dimension: 1/2 inch.
5. Laminate Cladding for Exposed Surfaces: High-pressure decorative of grade indicated.

    a. Horizontal Surfaces Other Than Tops: HGS.
    b. Postformed Surfaces: HGP.
    c. Vertical Surfaces: HGS
    d. Edges: PVC tape, 0.018-inch minimum thickness, matching laminate in color, pattern, and finish.

6. Materials for Semiexposed Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS.

    a. Drawer Sides and Backs: Thermoset decorative overlay.
    b. Drawer Bottoms: Thermoset decorative overlay.

7. Colors, Patterns, and Finishes: As selected from manufacturer's full range.

E. Granite Countertops:

1. 3/4 inch Granite with 3/4 inch edge detail per drawings
2. Color: Granite slabs to be selected by owner and architect
3. Backsplash: 4" where indicated
4. Edge Treatment: Square edge with 1/16" radius edge

F. Plastic-Laminate Countertops:

1. High-Pressure Decorative Laminate Grade: HGS
2. Colors, Patterns, and Finishes: As selected from manufacturer's full range.
3. Edge Treatment: Same as laminate cladding on horizontal surfaces.
4. Core Material at Sinks: Particleboard made with exterior glue.

G. Natural Quartz and Resin Composite Countertops: Sheet or slab of natural quartz and plastic resin over continuous substrate.

1. Flat Sheet Thickness: 1-1/4 inch, minimum.
2. Natural Quartz and Resin Composite Sheets, Slabs and Castings: Complying with ISFA 3-01 and NEMA LD 3; orthophthalic polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.

    a. Manufacturers:
        1) Seieffe Corporation; OKITE®: www.okite.us.
        2) Terrazzo & Marble Supply Companies; DIFINITI Quartz: www.tmsupply.com.
        3) Wilsonart, LLC: www.wilsonart.com.
        4) Caesar Stone. www.caesarstone.com. **Basis of Design.**

    b. Factory fabricate components to the greatest extent practical in sizes and shapes indicated; comply with the MIA Dimension Stone Design Manual.
    c. Finish on Exposed Surfaces: Polished.
    d. Color and Pattern: As indicated on drawings.

3. Other Components Thickness: 3/4 inch, minimum.
4. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
5. Skirts: As indicated on drawings.
6. Fabricate in accordance with AWI/AWMAC/WI (AWS), Section 11 - Countertops, Premium Grade.

H. Solid-Surfacing-Material Countertops:

1. Solid-Surfacing-Material Thickness: 1/2 inch.
2. Colors, Patterns, and Finishes: As per owner selected sample; coordinate with Architect.
3. Fabricate tops in one piece with shop-applied backsplashes and edges, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.

I. Flush Wood Paneling and Wainscots:

1. Lumber Trim and Edges: At fabricator's option, trim and edges indicated as solid wood (except moldings) may be either lumber or veneered construction compatible with grain and color of veneered panels.
2. Matching of Adjacent Veneer Leaves: Book match.
3. Veneer Matching within Panel Face: Running match.
4. Panel-Matching Method: No matching between panels is required. Select and arrange panels for similarity of grain pattern and color between adjacent panels.

J. Stairwork and Rails: (interior stair colors to be selected by architect)

1. Treads: Opaque finish.
2. Risers: Opaque finish.
3. Stringers: Opaque finish.
4. Balusters: n/a
5. Handrails: Transparent finish.
6. Scotia, Cove, and Other Moldings: Opaque finish.

K. Fire-Rated Interior Frames and Jambs: Products fabricated from fire-retardant particleboard or fire-retardant medium-density fiberboard with veneered, exposed surfaces and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1. Test Pressure: Test at atmospheric pressure.
2. Fire Rating: 20 minutes.

2.7 SHOP FINISHING

A. Finish architectural woodwork at fabrication shop. Defer only final touchup, cleaning, and polishing until after installation.

B. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling.

C. Transparent Finish: Comply with requirements indicated below for grade, finish system, staining, and sheen, with sheen measured on 60-deg ree gloss meter per ASTM D 523:

1. Grade: Premium.
2. AWI Finish System: TR-4, conversion varnish] [TR-5, catalyzed vinyl lacquer] [TR-6, catalyzed polyurethane.
3. WIC Finish System: catalyzed polyurethane.
4. Staining: Match approved sample for color.
5. Wash Coat for Stained Finish: Apply a vinyl wash coat to woodwork made from closed-grain wood before staining and finishing.
6. Open-Grain Woods: After staining (if any), apply paste wood filler to open-grain woods and wipe off excess. Tint filler to match stained wood.
7. Sheen: Satin, 30-50 gloss units.

D. Opaque Finish: Comply with requirements indicated below for grade, finish system, color, effect, and sheen, with sheen measured on 60-deg ree gloss meter per ASTM D 523.

1. Grade: Premium.
2. AWI Finish System: OP-6, catalyzed polyurethane.
3. WIC Finish System: Catalyzed polyurethane.
4. Color: As selected in finish system specified].
5. Sheen: Satin, 30-50 gloss units.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Condition woodwork to average prevailing humidity conditions in installation areas and examine and complete work as required, including removal of packing and backpriming before installation.

B. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in this Section for type of woodwork involved.

C. Quality Standard: Install woodwork to comply with WIC Section 26 for the same grade specified in this Section for type of woodwork involved.

D. Install woodwork level, plumb, true, and straight to a tolerance of 1/8 inch in 96 inches Shim as required with concealed shims.

E. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces and repair damaged finish at cuts.

F. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

G. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base, if finished.

H. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation.

1. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips.

I. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop. Calk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."

J. Paneling: Anchor paneling to supporting substrate with concealed panel-hanger clips. Do not use face fastening, unless covered by trim.

K. Stairwork and Rails: Cut carriages to accurately fit treads and risers and securely anchor to supporting substrates. Glue treads to risers, and glue and nail treads and risers to carriages. Glue and wedge treads and risers to housed stringers

1. Install stairwork with treads and risers no more than 1/8 inch from indicated position and no more than 1/16 inch out of position for adjacent treads and risers.

END OF SECTION

SECTION 06 42 16

WOOD-VENEER PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Custom wood veneer paneling.

B. Solid wood panel trim.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Grounds and concealed blocking.

B. Section 09 9100 - Painting: Site finishing of wood veneer faced paneling.

1.03 REFERENCE STANDARDS

A. AWI (QCP) - Quality Certification Program; current edition at www.awiqcp.org.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

C. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; Hardwood Plywood & Veneer Association; 2009 (ANSI/HPVA HP-1).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on fire retardant treatment materials and application instructions.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

1. Minimum Scale of Detail Drawings: 1-1/2 inch to 1 foot.
2. Include plan of panel number sequencing.
3. Provide the information required by AWI/AWMAC/WI (AWS).

D. Samples: Submit two samples of finished plywood, 12_x_12 inch in size, illustrating wood grain and specified finish.

E. Samples: Submit two samples of wood trim, 12 inch long.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
2. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
3. Single Source Responsibility: Provide and install this work from single fabricator.

B. Quality Certification: Provide AWI (QCP) inspection report and quality certification of completed work.

1. Provide labels or certificates indicating that the work complies with requirements of AWI/AWMAC/WI (AWS) Grade or Grades specified.
2. Prior to delivery to the site provide shop drawings with certification labels.
3. Provide labels on each product when required by certification program.

4. Upon completion of installation provide certificate certifying that the installation and products meet the specified requirements.
5. Arrange and pay for inspections required for certification.
6. Replace, repair, or rework all work for which certification is refused.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire retardant requirements.

1.07 MOCK-UP

A. Construct mock-up, 12 feet long by 12 feet wide, illustrating full panel sheet, edge trim, joint trim, applied finish .

B. Locate where directed.

C. Approved, Mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect work from moisture damage.

B. Do not deliver wood materials to project site until building is fully enclosed and interior temperature and humidity are in accordance with recommendations of AWI//AWMAC/WI (AWS).

PART 2 PRODUCTS

2.01 PANELING

A. Quality Level: Unless otherwise indicated provide products of quality specified by AWI//AWMAC/WI (AWS) for Custom Grade.

B. Flat Paneling:
1. Species: White Oak
2. Cut: Rift
3. Panels: Veneer of full width and balanced sequence matched.
   a. Panels More Than One Leaf High: Architectural end matching.
4. Visible Edges and Reveals: As indicated on drawings.
5. Outside Corners: Mitered and splined.

2.02 WOOD-BASED MATERIALS - GENERAL

A. Wood fabricated from old growth timber is not permitted.

B. Hardwood Plywood: HPVA HP-1 Grade A; veneer core, type of glue recommended for application; of grain quality suitable for transparent finish.

2.03 ADHESIVES AND FASTENERS

A. Adhesives: Type suitable for intended purpose, complying with applicable air quality regulations.

2.04 ACCESSORIES

A. Wood Filler: Tinted to match surface finish color.

2.05 FABRICATION

A. Shop prepare and identify panels for grain matching during site erection.

B. Prepare panels for delivery to site, permitting passage through building openings.

C. Finish exposed edges of panels as specified by grade requirements.

D. When necessary to cut and fit on site, provide materials with ample allowance for cutting and scribing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated on shop drawings.

B. Verify adequacy of backing and support framing.

C. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) requirements for grade indicated.

B. Do not begin installation until wood materials have been fully acclimated to interior conditions.

C. Set and secure materials and components in place, plumb and level, using concealed fasteners wherever possible.

D. Where necessary to cut and fit on site, scribe work abutting other components. Do not use additional overlay trim to conceal gaps.

E. Coordinate the installation of firestopping behind paneling.

F. Set exposed fasteners, fill with wood filler, and finish to match panel finish.

3.03 PREPARATION FOR FIELD FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Site Finishing: Refer to Section 09 9123.

3.04 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION 06 42 16

SECTION 07 21 11

SPRAY FOAM INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Spray-in-place semi-rigid open-cell polyurethane foam insulation in assemblies indicated on the Drawings, to provide an air barrier and improved thermal resistance.

1.2 RELATED SECTIONS

A. Section 03300 - Cast in Place Concrete.

B. Section 04200 - Unit Masonry.

C. Section 05400 - Cold Formed Metal Framing.

D. Section 06100 - Rough Carpentry.

E. Section 07800 - Fireproofing.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
1. ASTM C 423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
2. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
3. ASTM D 1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
4. ASTM D 1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics.
5. ASTM D 1623 - Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.
6. ASTM D 2856 - Standard Test Method for Open-Cell Content of Rigid Cellular Plastics by the Air Pycnometer.
7. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
8. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.
9. ASTM E 283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
10. ASTM E 413 - Classification for Rating Sound Insulation.

B. International Code Council - International Building Code:
1. Section 104.11 Alternative materials, design and methods of construction and equipment.
2. Section 2603 Foam Plastic Insulation.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:
1. Contractor performing work under this section shall be trained by DEMILEC USA in the art of applying spray polyurethane foam insulation.
2. Provide current DEMILEC USA Authorized Contractor Certification.
3. Provide InSeal Right Quality Assurance Program Certificate of Compliance

1.5 DELIVERY, STORAGE, AND HANDLING

A. Materials shall be delivered in manufacturer's original containers clearly labelled with manufacturer's name, product identification, safety information, net weight of contents and expiration date.

B. Material shall be stored in a safe manner and where the temperatures are in the limits specified by the material manufacturer.

C. Empty containers shall be removed from site on a daily basis.

D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.6 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

B. Ventilate area to receive insulation to maintain safe working conditions.

C. Protect workers as recommended by standards and manufacturer's recommendations.

D. Protect adjacent surfaces, windows, equipment and site areas from damage of overspray.

1.7 WARRANTY

A. Manufacturer's Warranty: DEMILEC USA warrants spray-in-place urethane foam insulation, when installed by certified contractors using factory-trained applicators and applied in accordance to the Product Specification, will perform as stated in the Product Technical Data Sheet.
   1. This warranty is in effect throughout the life of the building provided the original purchaser registers with the Warranty Department of the Manufacturer within thirty days of occupancy.
   2. Manufacturer's sole responsibility under this Limited Lifetime Warranty shall be to repair or replace any defective Product at the cost of the material only.
   3. Manufacturer shall not be responsible for labor cost or any other costs whatsoever related to, or in connection with the removal or installation of either the original or replacement product.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: DEMILEC USA, which is located at: 2925 Galleria Dr, ; Arlington, TX 76011; Toll Free Tel: 877-DEMILEC; Tel: 817-640-4900; Fax: 817-633-2000; Email: engineering@demilecusa.com; Web: www.demilecusa.com

B. Substitutions: Permitted.

2.2 SPRAY FOAM INSULATION

SECTION 07 21 11

SPRAY FOAM INSULATION

A. Spray Applied Semi Rigid Polyurethane Open Cell Foam Insulation System:
   1. Product: SEALECTION 500 Manufactured by DEMILEC USA, Arlington, TX.
   2. Product Approval:
      a. International Code Council Evaluation Services Report #1172.
         1) Approved for building types I, II, III, IV, & V.
      b. Passed NFPA 286 in accordance with IBC 803.2.
      c. Warnock Hersey Evaluation # 193-7081.
      d. CCMC Evaluation # 12697-R.
   3. Installation:
      a. Application with a prescriptive Thermal Barrier:
         1) Up to 9-1/4 inches (235 mm) for wall cavities and 14 inches (356 mm) in floors or ceilings with 1/2 inch gypsum wall board or equivalent 15 minute thermal barrier in accordance with IBC 2603.4 or IRC R316.4.
      b. Application without a Thermal or Ignition Barrier (exposed foam)
         1) Up to 5-1/2 inches (140 mm) in walls and 10 inches (254 mm) in floors and ceilings with all foam surfaces covered with 14 dry mils (0.36 mm) [25 wet mils (0.64 mm)] of Blazelok TB.
      c. Attics and Crawlspaces: Passed AC 377 Appendix X compliant NFPA 286.
         1) Application with Blazelok IB4 Intumescent Coating:
            a) Up to 9-1/2 inches (241 mm) on vertical surfaces and 11-1/2 inches (292 mm) on the underside of the top of the space with all foam surfaces covered with a minimum nominal thickness of 3 dry mils (0.08 mm) [5 wet mils (0.13 mm)] of Blazelok IB4.
         2) Application with Andek Fireguard Intumescent Coating:
            a) Up to 9-1/2 inches (241 mm) on vertical surfaces and 11-1/2 inches (292 mm) on the underside of the top of the space with all foam surfaces covered with a minimum nominal thickness of 10 dry mils (0.25 mm) [20 wet mils (0.51 mm)] of Andek Fireguard.
         3) Application with No-Burn Plus XD Intumescent Coating:
            a) Up to 9-1/2 inches (241 mm) on vertical surfaces and 11-1/2 inches (292 mm) on the underside of the top of the space with all foam surfaces covered with a minimum nominal thickness of 4 dry mils (0.10 mm) [6 wet mils (0.15 mm)] of No-Burn Plus XD.
      d. Use on Attic Floors:
         1) Applied between and over the joists in an attic floor.
            a) Up to 14 inches (356 mm.
            b) SEALECTION 500 may be left exposed without an intumescent coating in accordance with ASTM E 970.
      e. One-Hour Fire-Resistance-Rated Wall Assemblies: Non load-bearing
         1) Refer to ESR1172 Section 4.5
      f. Exterior Walls of Type I, II, III, and IV
         1) Up to 3-5/8 inches (92 mm)
      g. Non load-bearing NFPA 285-tested Wall Assembly
         1) Refer to ESR 1172 Section 4.6.1
   4. Physical Properties:
      a. Density (ASTM D 1622): 0.45 - 0.5 lb/cf (0.007 to 0.008 gm/cu. cm).
      b. Thermal Resistance (ASTM C 518):
         1) R-3.81 (sf.h degree F/BTU) at 1 inch at 90 days at 76 degree F (24.4 degree C).
         2) See ESR 1172 for R-value table.

c. Air Leakage (ASTM E 283-04):
   1) 3.5 inches (89 mm) At 75 Pa (25 mph wind): 0.001 L/s•m².
   2) 5.5 inches (140 mm) At 75 Pa (25 mph wind): 0.001 L/s•m².
   3) 10 inches (254 mm) At 75 Pa (25 mph wind): 0.002 L/s•m².
   4) Sustained Wind Load for 60 minutes At 1000 Pa (90 miles/hr. wind): No Damage.
   5) Gust Wind Load Test at 3000 Pa (160 miles/hr.): No Damage.
d. Compressive Strength (ASTM D 1621): 0.7 psi (4.83 kPa).
e. Tensile Strength (ASTM D 1623): 5.6 lbf/sq. inch (38.6 kPa).
f. Sound Transmission Class (STC) (ASTM E 413-87 1999): 49-51. Based on Specific wall design.
g. Noise Reduction Coefficient (NRC) (ASTM C 423): .75.
h. Water Vapor Transmission (ASTM E 96):
   1) 3.5 inches (89 mm): 6.6 Perms.
   2) 5.5 inches (140 mm): 4.2 Perms.
   3) 7 inches (178 mm): 3.3 Perms.
   4) 10 inches (254 mm): 2.3 Perms.
i. Off Gassing Tests (VOC Emissions) CGSB 51.23-92: Pass (No toxic vapors).
j. Surface Burning Characteristics (ASTM E 84) 6 inches (152 mm): Class I. Flame Spread Index 21, Smoke Developed Index 216.

5. Equipment used to apply the foam insulation shall have fixed ratio positive displacement pumps and approved by foam manufacturer.

2.3 ACCESSORY PRODUCTS

A. Water Based Fire Protection:
1. Product: Andek Fireguard, manufactured by Andek Corporation.
2. Application: Follow manufacturer's application recommendations.
3. Approval: Complies with 2006 IRC 314.6, 2009 IRC 316.6, IBC 2603.9 and AC 377 over all surfaces of SEALECTION 500.
4. Physical Properties:
   a. Surface Burning Characteristics (ASTM E 84): Class I. Flame Spread Index 5, Smoke Developed Index 30.
   b. Flash Point: None
   c. Volatility/VOC: 0
   d. Non-toxic, drain safe, water based, non-fuming.
5. Color: As selected from manufacturer’s 26 standard colors, including black, white and custom tints.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Commencement of work outlined in this section shall be deemed as acceptance of existing work and conditions.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Apply only when surfaces and environmental conditions are within limits prescribed by the material manufacturer.

C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions. Apply as recommended by manufacturer to thickness as indicated on drawings.

B. Apply thermal barrier as required by applicable codes noting the following:
   1. Except as provided in Section 314.5 and Section 314.6 of the 2006 International Residential Code, Section 316.5 and Section 316.6 of the 2009 International Residential Code and Section 2603.4.1 and Section 2603.9 of the International Building Code, all plastic insulation shall be separated from the interior of the building by an approved thermal barrier of 1/2 inch (13 mm) gypsum wallboard or equivalent thermal barrier material.
   2. Code compliant fire protection may be achieved with the use of BLAZELOK IB, BLAZELOK TB, BLAZELOK TB 200 with BLAZELOK TB 200 Primer, Andek Fire Guard, and/or NO-Burn Plus XD depending on the details of the application.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07 20 12

BLANKET INSULATION

PART 1 - GENERAL

GENERAL: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification section, apply to work of this section.

DESCRIPTION OF WORK: Extent of insulation specified in this section included by provisions of this section.

Applications of insulation specified in this section include the following:

Blanket-type building insulation.
Blanket-type sound insulation.

QUALITY ASSURANCE:

Thermal Conductivity: Thickness indicated are for thermal conductivity (k-value at 75°F or 25°C) specified for each material. Provide adjusted thickness as directed for equivalent use of material having a different thermal conductivity. Where insulation is identified by “R” value, provide thickness to achieve indicated value.

Fire and Insurance Ratings: Comply with fire-resistance, flammability and insurance ratings indicated and comply with regulations as interpreted by governing authorities.

Code Requirements: All insulation and insulation assemblies shall have a flame spread of 25 or less, smoke developed factor of 450 or less, ASTM E 84.

Comply with the requirements of the specification but in no case shall insulation or insulation assemblies meet less than the requirements of Section 719, Standard Building Code (SBC), 1979 edition as amended.

SUBMITTALS:

Product Data: Submit manufacturer’s product specifications and installation instructions for each type of insulation material required including data substantiating that the materials comply with specified requirements.

PRODUCT HANDLING:

General Protection: Protect insulation’s from physical damage and from becoming wet, soiled or covered with or snow. Comply with manufacturer’s recommendations for handling, storage and protection during installation.

PART 2 - PRODUCTS

MATERIALS:

Mineral/Glass Fiber Blanket/Batt Insulation (M/GFB-Ins): Inorganic (non-asbestos) fibers formed with binders into resilient flexible blankets or semi-rigid batts; FS HH-I-521, type as indicated, densities of not less than 0.5 lbs. per cu. ft. for glass fiber units and not less than 2.5 lb. per cu. ft. for mineral wool units, k-value of 0.27; manufacturer’s standard lengths and widths as required to coordinate with spaces to be insulated; types as follows:

Provide Type I unfaced units where indicated and where fully enclosed within wallboard, semi-rigid in vertical spaces and where self-support is required. Provide poultry wire at open walls to

support insulation. Provide galvanized poultry wire netting to support insulation, suspended below the metal decking.

Provide Type II reflective vapor barrier faced units where indicated and where insulation facing is not concealed by wallboard; aluminum foil barrier (flame resistant) with rating of 0.5 perms. other face (if any) with rating grater than 5.0 perms.

Provide Type III unfaced noise barrier batt insulation where indicated and where sound deadening is required. Batts are to be 16-24" wide, 3#/cu. ft. density 3½" thick. Provide semi-rigid batts at open walls or support insulation with poultry wire.

Provide Type IV unfaced fire and smoke safing providing fire, smoke, noise and thermal control at floor junctions and as chase framing closures where required. Safing shall be mineral fiber meeting ASTM E-119 time test for one hour minimum. Provide 20 gauge steel safing clips at 24" on center for safing support.

Flame-Spread Rating: Provide units with rating of 25, ASTM E 84

Fire-Resistance Rating: Where units are included in rated wall/ceiling/floor construction, provide mineral wool units which have been tested and rated as required for the indicated assembly. Use as safing.

Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

Certain-Teed Products Corp.; Valley Forge, PA
Clecon Inc.; Cleveland, OH
Manville Bldg. Materials Corp.; Denver, CO
Mizell Bros. Co.; Atlanta, GA
Owens-Corning Fiberglass Corp.; Toledo, OH
Forty-Eight Insulation's, Inc.; Aurora, IL
Rockwool Industries, Inc.; Englewood, CO
United States Gypsum Co.; Chicago, IL

Auxiliary Insulating Materials:

Adhesive for Bonding Insulation: Type recommended by insulation manufacturer and complying with fire-resistance requirements.

Netting at Un-faced Insulation: Provide 16 gauge galvanized wire mesh between roof trusses where noted on plans to support batt insulation and in open walls. Mesh size 2" X 2" 5/8" 36" in or 48" roll widths or 2" galvanized poultry netting. Provide vinyl coated galvanized ring anchors for roll lap anchoring. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, General Hardware Inc., Atlanta, GA or Keystone Steel and Wire Inc., Peoria, IL.

Mechanical Anchors: Type and size shown or, if not shown, as recommended by insulation manufacturer for type of application and condition of substrate.

Mastic Sealer: Type recommended by insulation manufacturer for bonding edge joints between units and filling voids in work.

PART 3 - EXECTUION

INSPECTION AND PREPARATION:

Installer must examine substrates and conditions under which insulation work is to be performed and must notify Contractor in writing of unsatisfactory conditions. Do not proceed with insulation work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

Clean substrates of substances harmful to insulations or vapor barriers, including removal of projections which might puncture vapor barriers.

INSTALLATION:

General: Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.

Extend insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections which interfere with placements.

Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

General Building Insulation:

Apply insulation units to substrate by methods indicated, complying with manufacturer's recommendations. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

Set vapor barrier faced units with barrier to exterior side of construction, except as otherwise shown.

Tape joints and ruptures in vapor barrier and seal each continuous area of insulation to surrounding construction to ensure vapor-tight installation.

Stuff loose mineral fiber insulation into miscellaneous voids and cavity spaces where shown and as required to maintain fire ratings. Compact to approximately 40% or normal maximum volume (to a density of approximately 2.5 lbs. per cu. ft.).

Install insulation behind poultry netting by setting these materials between studs purlins or joist such that insulation shall lay flat and snug against joist yet sufficiently loose to prevent excessive compression and subsequent loss of insulating value. Lap poultry netting one mesh spacing and provide wire tie at 16" along edges (provide clamp type circular wire ties).

PROTECTION:

General: Protect installed insulation form harmful weather exposures and from possible physical abuses, where possible by non-delayed installation of concealing work or, where that is not possible, by temporary covering or enclosure. Installer shall advise Contractor or exposed hazards, including possible sources of deterioration and fire hazards.

END OF SECTION

SECTION 07 21 13

BOARD INSULATION

PART 1 GENERAL

1.1 SUBMITTALS

A. Action Submittals:
   1. Product Data: Manufacturer's descriptive data and product attributes for insulation.

B. Informational Submittals:
   1. Certificate of Compliance: Certification that installed products meet specified fire hazard requirements.

1.2 QUALITY ASSURANCE

A. Installer Qualifications: Firm specializing in work of this Section with minimum 2 years' experience.

B. Regulatory Requirements:
   1. Fire Hazard Characteristics: Maximum flame spread/smoke developed rating of 25/50 tested to ASTM E84.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Polystyrene Insulation: Following manufacturers are acceptable if products meet specified requirements:
   1. Atlas Roofing. www.atlasroofing.com
   2. Dow Chemical. www.dow.com
   3. Owens Corning. www.owenscorning.com

B. Polyisocyanurate Insulation: Following manufacturers are acceptable if products meet specified requirements:
   1. Atlas Roofing. www.atlasroofing.com
   2. Dow Chemical. www.dow.com
   3. Hunter Panels. www.hunterpanels.com
   4. Rmax. www.rmax.com
   5. OX Engineered Products. www.oxengineeredproducts.com

C. Glass Fiber Insulation: Following manufacturers are acceptable if products meet specified requirements:
   1. Johns Manville. www.jm.com
   2. Knauf Insulation. www.knaufinsulation.com
   3. Owens Corning. www.owenscorning.com

D. Substitutions: Refer to Division 01

2.2 MATERIALS

A. Board Insulation:

   1. Type: Rigid polyisocyanurate faced both sides with glass fiber mat facings, non-reinforced core.
   2. Meet ASTM C1289.

2.3 ACCESSORIES

A. Tape: 4 nches wide, pressure sensitive .

PART 3 EXECUTION

3.1 INSTALLATION

A. Install insulation in accordance with manufacturer’s instructions.

B. Secure insulation with metal impale fasteners.

C. Tape seal to perimeter and at joints between insulation pieces.

END OF SECTION

SECTION 07 25 00

BUILDING WRAP

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Weather barrier membrane
B. Seam Tape
C. Flashing
D. Fasteners

1.2 REFERENCES

A. ASTM International
   1. ASTM C920; Standard Specification for Elastomeric Joint Sealants
   2. ASTM C1193; Standard Guide for Use of Joint Sealants
   3. ASTM D882; Test Method for Tensile Properties of Thin Plastic Sheeting
   4. ASTM D1117; Standard Guide for Evaluating Non-woven Fabrics
   5. ASTM E84; Test Method for Surface Burning Characteristics of Building Materials
   6. ASTM E96; Test Method for Water Vapor Transmission of Materials
   7. ASTM E1677; Specification for Air Retarder Material or System for Framed Building Walls
   8. ASTM E2178; Test Method for Air Permeance of Building Materials
B. AATCC – American Association of Textile Chemists and Colorists
   1. Test Method 127 Water Resistance: Hydrostatic Pressure Test
C. TAPPI
   1. Test Method T-410; Grams of Paper and Paperboard (Weight per Unit Area)
   2. Test Method T-460; Air Resistance (Gurley Hill Method)

1.3 SUBMITTALS

A. Refer to Section 01 33 00 Submittal Procedures.
B. Product Data: Submit manufacturer current technical literature for each component.
C. Samples: Weather Barrier Membrane, minimum 8-1/2 inches by 11 inch.
D. Quality Assurance Submittals
   1. Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements.
   2. Manufacturer Instructions: Provide manufacturer's written installation instructions.
   3. Manufacturer's Field Service Reports: Provide site reports from authorized field service representative, indicating observation of weather barrier assembly installation.
E. Closeout Submittals
   1. Refer to Section 01 77 00 Closeout Submittals.

2. Weather Barrier Warranty: Manufacturer's executed warranty form with authorized signatures and endorsements indicating date of Substantial Completion.

1.4 QUALITY ASSURANCE

A. Qualifications
   1. Installer shall have experience with installation of commercial weather barrier assemblies under similar conditions.
   2. Installation shall be in accordance with weather barrier manufacturer's installation guidelines and recommendations.
   3. Source Limitations: Provide commercial weather barrier and accessory materials produced by single manufacturer.

B. Mock-up
   1. Install mock-up using approved weather barrier assembly including fasteners, flashing, tape and related accessories per manufacturer's current printed instructions and recommendations.
      a. Mock-up size: 10 feet by 10 feet.
      b. Mock-up Substrate: Match wall assembly construction, including window opening.
      c. Mock-up may not remain as part of the work.
   2. Contact manufacturer's designated representative prior to weather barrier assembly installation, to perform required mock-up visual inspection and analysis as required for warranty.

C. Pre-installation Meeting
   1. Refer to Section 01 31 00 Project Management and Coordination.
   2. Hold a pre-installation conference, two weeks prior to start of weather barrier installation. Attendees shall include Contractor, Architect, Engineer, Installer, Owner's Representative, and Weather Barrier Manufacturer's Designated Representative.
   4. Review all related project requirements and submittals, status of substrate work and preparation, areas of potential conflict and interface, availability of weather barrier assembly materials and components, installer's training requirements, equipment, facilities and scaffolding, and coordinate methods, procedures and sequencing requirements for full and proper installation, integration and protection.

1.5 DELIVERY, STORAGE AND HANDLING

A. Refer to Section 01 60 00 Materials and Equipment.

B. Deliver weather barrier materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Store weather barrier materials as recommended by weather barrier manufacturer.

1.6 SCHEDULING

A. Review requirements for sequencing of installation of weather barrier assembly with installation of windows, doors, louvers and flashings to provide a weather-tight barrier assembly.

B. Schedule installation of weather barrier materials and exterior cladding within nine months of

weather barrier assembly installation.

1.7 WARRANTY

A. Special Warranty
   1. Special weather-barrier manufacturer's warranty for weather barrier assembly for a period of ten (10) years from date of final weather barrier installation.
   2. Preinstallation meetings and jobsite observations by weather barrier manufacturer for warranty is required prior to assembly installation.
   3. Warranty areas:
      a. Exterior walls with stucco or manufactured stone (only) shall have 15# felt over Tyvek.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. DuPont Tyvek Housewrap & Commercialwrap (basis of design).
B. Typar Housewrap & Metrowrap
C. Dow Weathermate Plus Housewrap & DuPont Tyvek Commercialwrap.

2.2 MATERIALS

A. Basis of Design at one and two story buildings: Textured, spunbonded polyolefin, non-woven, non-perforated, weather barrier is based upon DuPont™ Tyvek® HouseWrap® and related assembly components.
B. Basis of Design at four story building: Textured, spunbonded polyolefin, non-woven, non-perforated, weather barrier is based upon DuPont™ Tyvek® CommercialWrap® and related assembly components.
B. Performance Characteristics:
   1. Air Penetration: 0.004 cfm/ft^2 at 75 Pa, when tested in accordance with ASTM E2178. Type I per ASTM E1677.
   2. Water Vapor Transmission: 50 perms, when tested in accordance with ASTM E96, Method B.
   3. Water Penetration Resistance: 210 cm when tested in accordance with AATCC Test Method 127.
   4. Basis Weight: 2.1 oz/yd^2, when tested in accordance with TAPPI Test Method T-410.
   5. Air Resistance: 300 seconds, when tested in accordance with TAPPI Test Method T-460.
   6. Tensile Strength: 30/30 lbs/in., when tested in accordance with ASTM D882, Method A.
   7. Tear Resistance: 7/9 lbs, when tested in accordance with ASTM D1117.
   8. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84. Flame Spread: 5, Smoke Developed: 25

2.3 ACCESSORIES

A. Seam Tape: 3 inch wide, DuPont™ Tyvek® Tape.

B. Fasteners:
   1. Tyvek® Wrap Caps, as manufactured by DuPont Building Innovations: #4 nails with large 1-inch plastic cap fasteners.

C. Sealants
   1. Refer to Section 07 92 00 Joint Sealants.

D. Adhesives:
   1. Products:
      a. Liquid Nails® LN-109
      b. Polyglaze® SM 5700
      c. Denso Butyl Liquid
      d. 3M High Strength 90
      e. SIA 655
      f. Adhesives recommend by the weather barrier manufacturer.

E. Primers:
   1. Provide flashing manufacturer recommended primer to assist in adhesion between substrate and flashing.
   2. Products:
      a. 3M High Strength 90
      b. Denso Butyl Spray
      c. SIA 655
      d. Permagrip 105
      e. ITW TACC Sta' Put SPH
      f. Primers recommended by the flashing manufacturer

F. Flashing
   1. DuPont™ FlexWrap™, as manufactured by DuPont Building Innovations: flexible membrane flashing materials for window openings and penetrations.

   AND/OR

   2. DuPont™ StraightFlash™, as manufactured by DuPont Building Innovations: straight flashing membrane materials for flashing windows and doors and sealing penetrations such as masonry ties, etc.

   AND/OR

   3. DuPont™ StraightFlash™ VF, as manufactured by DuPont Building Innovations: dual-sided straight flashing membrane materials for brick mold and non-flanged windows and doors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify substrate and surface conditions are in accordance with weather barrier manufacturer

recommended tolerances prior to installation of weather barrier and accessories.

3.2 INSTALLATION – WEATHER BARRIER

A. Install weather barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations.

B. Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner to overlap.

C. Apply wrap with grooved surface pattern in vertical direction.

D. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface. Maintain weather barrier plumb and level

E. Shingle weather barrier over back edge of weep screed. Seal weather barrier with sealant or tape to weep screed. Ensure weeps are not blocked.

F. Subsequent layers shall overlap lower layers a minimum of 6 inches horizontally in a shingling manner.

G. Window and Door Openings: Extend weather barrier completely over openings.

H. Weather Barrier Attachment:

1. Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommended fasteners, space 12 -18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally.

I. Apply 4 inch by 7 inch piece of DuPont™ StraightFlash™ to weather barrier membrane prior to the installation cladding anchors.

3.3 SEAMING

A. Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.

B. Seal any tears or cuts as recommended by weather barrier manufacturer.

3.6 OPENING PREPARATION

A. Cut weather barrier in a modified “I-cut” pattern.

1. Cut weather barrier horizontally along the bottom of the header.
2. Cut weather barrier vertically 2/3 of the way down from top center of window opening.
3. Cut weather barrier diagonally from bottom of center vertical cut to the left and right corners of the opening.
4. Fold side and bottom weather barrier flaps into window opening and fasten.

B. Cut a head flap at 45-degree angle in the weather barrier at window head to expose 8 inches of sheathing. Temporarily secure weather barrier flap away from sheathing with tape.

3.7 FLASHING

A. Cut 9-inch wide DuPont™ FlexWrap™ a minimum of 12 inches longer than width of sill rough opening.

B. Cover horizontal sill by aligning DuPont™ FlexWrap™ edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.

C. Fan DuPont™ FlexWrap™ at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges.

D. On exterior, apply continuous bead of sealant to wall or backside of window mounting flange across jambs and head. Do not apply sealant across sill.

E. Install window according to manufacturer's instructions.

F. Apply 4-inch wide strips of DuPontÈ StraightFlash™ at jambs overlapping entire mounting flange. Extend jamb flashing 1-inch above top of rough opening and below bottom edge of sill flashing.

G. Apply 4-inch wide strip of DuPont™ StraightFlash™ as head flashing overlapping the mounting flange. Head flashing should extend beyond outside edges of both jamb flashings.

H. Position weather barrier head flap across head flashing. Adhere using 4-inch wide DuPont™ StraightFlash™ over the 45-degree seams.

I. Tape head flap in accordance with manufacturer recommendations.

J. On interior, install backer rod in joint between frame of window and flashed rough framing. Apply sealant around entire window to create air seal. Apply sealant in accordance with sealant manufacturer's instructions and ASTM C 1193.

3.8 FIELD QUALITY CONTROL

A. Notify manufacturer's designated representative to obtain required periodic observations of weather barrier assembly installation.

3.9 PROTECTION

A. Protect installed weather barrier from damage.

END OF SECTION

SECTION 07 26 00

VAPOR RETARDER

PART 1 GENERAL

1.1 SUMMARY

A. Products Included in this Section:
   1. Vapor retarder, seam tape, mastic, pipe boots, and detail strip for installation under concrete slabs.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM)
   1. ASTM E 1745-97 (2004) Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs
   2. ASTM E 154-88 (2005) Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs
   3. ASTM E 96-95 Standard Test Methods for Water Vapor Transmission of Materials
   4. ASTM E 1643-98 (2005) Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs

B. American Concrete Institute (ACI)
   1. ACI 302.2R-06 Vapor Barrier Component (plastic membrane) is not less than 10 mils thick

1.3 SUBMITTALS

A. General: Submit following items in accordance with Section 01 33 00:
   1. Full set of test results as per paragraph 8.3 of ASTM E 1745.
   2. Manufacturer's samples, literature
   3. Manufacturer's installation instructions for placement, seaming and pipe boot installation

1.2 DELIVERY, STORAGE AND HANDLING

A. Comply with requirements of Section 01 60 00.
B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

1.3 SEQUENCING

A. Begin installation only after substrate work is complete and penetrations are securely anchored.

PART 2 PRODUCTS

2.1 MATERIALS

A. Vapor Retarder must have all of the following qualities:
   1. Permeance of 0.03 Perms [grains/(ft^2 *hr * in.Hg)] or less per ASTM F 1249 or ASTM E 96
   2. ASTM E 1745 Class C
   3. Minimum of 10 mils thickness

B. Vapor Retarder Products:

1. Stego Wrap Class C Vapor Retarder (10-mil) by Stego Industries, LLC
2. Raven Industries, Inc. Vapor Block 10
3. Griffolyn Type-65 by Reef Industries

2.2 ACCESSORIES

A. Seam Tape:

1. Stego Tape by Stego Industries LLC (877) 464-7834
2. VaporBond Tape by Raven Industries
3. Griffolyn Fab Tape.

B. Pipe Boots

1. Construct pipe boots from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine conditions and proceed with Work in accordance with Section 01 40 00.
B. Verify that substrate work is complete, clean and dry before beginning installation of sheet products. Ensure that subsoil is approved by Architect or Geotechnical Engineer.
C. Level and tamp or roll aggregate, sand or granular base.

3.2 INSTALLATION

A. Under Slab-on-Grade:
   1. Install vapor barrier in accordance with manufacturer's instructions and ASTM E 1643-09
   2. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete pour.
   3. Lay-out sheets to minimize quantity of joints. Lap edge and end joints 12 inches minimum and continuously seal with joint tape.
   4. Turn up sheets at perimeter; at footers and vertical walls, and against penetrations. Seal joints with tape.
   5. Seal all penetrations (including pipes) per manufacturer's instructions.
   6. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
   7. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all four sides with tape.

3.3 PROTECTION

A. Protect sheets from puncture during installation. Patch punctures before proceeding with subsequent construction.

B. Install runway planks in construction traffic lanes until slabs are poured.

END OF SECTION

SECTION 07 41 13

PREFORMED METAL ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES
1. Metal panel roof system complete with related flashings, closures, trim and accessories.
2. Felt underlayment.
3. Clips, anchoring, devices, fasteners, and accessories required for installation of panel system.

1.2 SYSTEM REQUIREMENTS
1. Performance Requirements
    1. Air infiltration: Maximum 0.08 cu. ft. per sq. ft. of surface with 4 psf air pressure differential when tested in accordance with ASTM E283.
    2. Water resistance: No evidence of uncontrolled leakage at 4 psf pressure differential when tested in accordance with ASTM E331.
    3. Design and install system to accommodate thermal expansion, thermal contraction, and building movement.

1.3 SUBMITTALS
1. General: Submit following items in accordance with Section 01 33 00.
2. Product Data: Submit manufacturer's technical literature indicating properties of materials, finishes, and performance capabilities.
3. Manufacturer's Instructions: Submit written installation instructions indicating method and sequence of installation.

1.4 DELIVERY, STORAGE AND HANDLING
1. Deliver, store, handle, and protect products in accordance with Section 01 60 00.

1.5 WARRANTY
1. Warrant installed system to be free of leaks and free from defects in materials and workmanship.
    1. Warranty period: Five (5) years from date of Substantial Completion of project.
2. Warrant factory finish to be free of cracks, splits, crazing, chipping, peeling, color fading, and rusting.
    1. Warranty period: Twenty (20) years from date of Substantial Completion of project.

PART 2 PRODUCTS

2.1 MANUFACTURERS
1. Acceptable Manufacturers
    1. Alumax/Howmet, Building Specialties Division, Mesquite, TX.
    2. AEP Span, Dallas Corp., Dallas, TX.
    3. Merchant and Evans Industries, Burlington, NJ.
    4. MM Systems Corp., Tucker, GA.
    5. Berridge Manufacturing Co., Houston, TX.
    6. MBCI, Houston, TX.
2. Substitutions: Submit in accordance with Section 01600.

2.2 STANDING SEAM ROOF PANELS - ACCEPTABLE PRODUCTS
1. Standing Seam System by AEP Span.

2.3 MATERIALS AND COMPONENTS

1. Sheet Steel: ASTM A792, Galvalume (Aluminum-Zinc Alloy), smooth finish, minimum 24 gage.
2. Sealants and Gaskets: Manufacturer's standard type suitable for use with installation of metal roofing; non-staining; skinning, non-shrinking and non-sagging; ultra-violet and ozone resistant for exterior applications; color to match exposed metal.
3. Fasteners: Manufacturer's standard type to suit applications; with soft neoprene washers; galvanized in accordance with ASTM A153; finished to match metal panels where exposed.
4. Powder Actuated Fasteners: Galvanized in accordance with ASTM A153, with soft neoprene washers, finished to match metal panels where exposed.
5. Internal and External Corners: Same materials, gage and finish as panels; profile to suit system; brake formed to required angles. Mitered internal corners, back braced with sheet stock, to maintain continuity of profile.
6. Trim, Closure Pieces, Cap, Flashings and Accessories: Same material, gage, and where exposed, of same finish as metal panels, brake formed to required profiles.
7. Underlayment: ASTM D226, No. 30 unperforated asphalt saturated felt.
8. Touch-up Paint: As recommended by manufacturer.
9. Bituminous Paint: Asphaltic type of composition recommended by panel manufacturer.

2.4 FABRICATION

1. Uniformly dimensioned, roll formed to exact lengths to avoid field cutting; intermediate horizontal seams not permitted.
2. Fabrication of component profiles on site not permitted.

2.5 FINISH

1. As selected by Architect and approved by Owner, to be submitted and approved prior to installation.

PART 3 EXECUTION

3.1 EXAMINATION

1. Examine surfaces for conditions that would adversely affect execution. Do not proceed until unsatisfactory conditions are corrected. Beginning of execution will constitute acceptance of existing conditions.
2. Inspect subroof to verify conditions are acceptable prior to beginning installation. Verify substrate is uniform and even.

3.2 INSTALLATION

1. Install metal roofing and related components in accordance with manufacturer's printed instructions. Fasten panels with concealed metal clips at each side joint.
2. Install single layer of underlayment horizontally on surfaces to receive preformed metal roofing. Weather lap edges minimum 6 inches and end laps 12 inches. Stagger vertical joints of each layer and joints of one layer to next. Securely fasten in place.
3. Install trim, closures, caps and accessories as indicated or required for complete weathertight installation.
4. Protect surfaces in contact with cementitious materials and dissimilar metals with application of bituminous paint. Allow to dry prior to installation.
5. Permanently fasten system to structure at spacings required by panel manufacturer. Align, level, and plumb, within specified tolerances. Use concealed fasteners unless approved otherwise by Architect. Provide expansion and control joints where indicted.
6. Seal and place gaskets to prevent weather penetration.
7. Tolerances

1. Maximum Offset from True Alignment Between Adjacent Members Butting or In line: 1/16 inch.
2. Maximum Variation from Plane or Location Indicated on Drawings: 1/8 inch.

8. Take special precautions in handling and installing bare Galvalume panels so that finish is not defaced or marred. Utilize tennis shoes, cloth gloves, and other apparel and precautions as recommended by metal manufacturer.
9. Any and all penetrations are to be located outside reveals.

3.3 PROTECTION

1. Protect system from damage, staining or soiling after installation. Replace components which have been scratched, dented, or otherwise showing signs of damage or improper installation.

END OF SECTION

SECTION 07 54 00
THERMOPLASTIC MEMBRANE ROOFING

PART 1 GENERAL

1.1 SUBMITTALS

A. Action Submittals:
1. Shop Drawings: Illustrate products, installation, and relationship to adjacent construction.
2. Product Data: Manufacturer's descriptive data and product attributes for insulation, roofing system, and accessories.
3. Samples: Verification samples.

B. Informational Submittals:
1. Certificate of Compliance: Certification that installed products meet specified roofing system requirements.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:
1. Attendance: Contractor, installer, and roofing manufacturer's representative.
2. Review and discuss: Contract Documents, roofing system manufacturer's requirements, project conditions, and scheduling.

1.3 QUALITY ASSURANCE

A. Installer Qualifications:
1. Firm specializing in work of this Section with minimum 3 years' experience.
2. Approved by roofing system manufacturer.

B. Roofing System:
1. FM 1-90 Windstorm Resistance and Hail Resistance, tested to FM 4470.
2. Perimeter flashings: FM 1-49.
3. Class A Fire Hazard Classification, tested to ASTM E108.
4. Energy Star qualified for project location; bear Energy Star label.
5. Solar Reflectance Index: Minimum 78, tested to ASTM C1549 and calculated in accordance with ASTM E1980.

1.4 WARRANTIES

A. Manufacturer's 20 year warranty against water leakage through roofing system.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. PVC Roofing System: Following manufacturers are acceptable if products meet specified requirements:
1. Carlisle Syntec. www.carlislesyntech.com
2. GAF. www.gaf.com
3. Johns Manville. www.jm.com
4. Sika. www.usa.sika.com
5. Versico. www.versico.com

B. TPO Roofing System: Following manufacturers are acceptable if products meet specified requirements:
1. Carlisle Syntec. www.carlislesyntech.com

2. Firestone Building Products. www.firestonebpco.com
3. GAF. www.gaf.com
4. Johns Manville. www.jm.com
5. Sika. www.usa.sika.com
6. Versico. www.versico.com
7. Substitutions: Refer to Division 01 6000 – Materials and Equipment

2.2 MATERIALS

A. Vapor Retarder: ASTM D1970 and ASTM E2178; SBS modified bitumen type.

B. Rigid Roof Insulation:
1. Type: ASTM C1289, rigid polyisocyanurate faced both sides with glass fiber facings.

C. Cover Board: ASTM C1177/C1177M or ASTM C1278/C1278M; 48 inches wide x ¼ inch thick.

D. Roof Membrane:
1. Type: Reinforced thermoplastic polyolefin TPO, ASTM D6878.
2. Thickness: 60 mils.
3. Color: White.

E. Flashing Sheet: Manufacturer's standard, to match membrane.

2.3 ACCESSORIES

A. Fastener Plates: Manufacturer's standard.

B. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.

C. Walkway Pads: TPO sheet in rolled form, diamond studded surface, tan with safety yellow edgings, minimum 30 inches wide. AND/OR refer to roof plan for dimensions.

D. Fasteners: Hot-dip galvanized or fluoropolymer coated steel.

E. Expansion Joint Covers: [EPDM] [Neoprene cover over closed cell foam insulation, [galvanized steel] [copper] flanges, preformed corners and intersections.

F. Nailers and Curbs: Preservative treated wood, specified in Section 06100.

G. Metal Flashings: 24 gage sheet metal laminated with TPO membrane.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Install roofing system in accordance with roofing system manufacturer's instructions, NRCA Manual, and approved Shop Drawings.

B. Roofing System: One ply vapor retarder, rigid insulation, cover board, and one ply roofing membrane.

3.2 INSTALLATION - VAPOR RETARDER

A. Apply one layer.

3.3 INSTALLATION - INSULATION

A. Apply in two layers.

B. Mechanically fasten to substrate.

3.4 INSTALLATION - COVER BOARD

A. Mechanically fasten to substrate.

3.5 INSTALLATION - ROOFING

A. Splice sheets by heat welding method.

B. Attach membrane to decking with fastener plates.

3.6 INSTALLATION - WALKWAY PADS

A. Set pads in full adhesive bed.

END OF SECTION

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SECTION INCLUDES

1. Roof eave flashings.
2. Downspouts and gutters.
3. Eave vents.
4. Wall flashings

1.2 SUBMITTALS

1. General: Submit following items under provisions of Section 01 33 00.
2. Product Data: Indicating performance and physical characteristics of roof ridge ventilators, gutter, and downspouts and accessories proposed for use.
3. Color Charts: Manufacturer's standard pre-finished product charts showing actual physical coating for gutters, downspouts, and roof edge drip flashing.
4. Manufacturer's Instructions: Printed manufacturer's installation instructions.
5. Warranty: Two copies of watertightness warranty, and finish coating warranty on pre-finished products for gutters, downspouts, and roof edge drip flashing.
6. Submit samples under provisions of Section 01 33 00.

1.3 QUALITY ASSURANCE

1. Installer Qualifications: Company specializing in sheet metal flashing work with three years minimum experience in similar sized installations.

1.4 DELIVERY, STORAGE AND HANDLING

1. Deliver, store, handle and protect products under provisions of Sections 01 60 05.
2. Stack pre-formed material to prevent twisting, bending, and abrasions, and to provide ventilation.
3. Prevent contact with materials, which may cause discoloration or staining.
4. Ship pre-coated products with strippable covering.

1.5 WARRANTY

1. Provide one year watertightness guarantee beginning at substantial completion including repair or replacement of defective materials and workmanship.

PART 2 PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS - SHEET MATERIALS

1. Galvanized Steel (concealed counterflashings): ASTM A525, G90 coating, hot dipped galvanized both sides flattened sheets, chemically treated, gage as recommended in Architectural Sheet Metal Manual for intended purposes (but no less than 26 ga.), as manufacturer by Bethlehem Steel or approved equal.
2. Aluminum (for gutters, downspouts, roof eave drip flashing, slab edges): ASTM B209, 5005 alloy, temper as required for intended application (15 KSI minimum), thickness as recommended in Specifications for Aluminum Sheet Metal Work in Building Construction for intended purposes, manufacturer at Contractor's option, pre-finished epoxy coating one side.
3. Continuous soffit vents: Amico 3” vinyl soffit vent
4. Sealant: One part, non-sag polyurethane.

2.2 FABRICATION

1. Form sections true to shape, accurate in size, square, free from distortion and defects, to profiles indicated in accordance with SMACNA Architectural Sheet Metal Manual.
2. Form pieces in longest practical lengths.
3. Hem exposed flashings on underside 1/2 inch; miter and seam corners.
4. Form materials which are typically concealed from view by the public with lap seams.
5. Solder and seal metal joints at balconies and door openings of upper floors, except those indicated or required to be expansive type joints. After soldering, remove flux. Wipe and wash solder joints clean.
6. Fabricate corners from one place with minimum 18 inch long legs; solder for rigidity or seal with sealant if approved by Owner.
7. Fabricate vertical faces with bottom edge formed outward 1/8 inch and hemmed to form drip.
8. Fabricate flashings to allow toe to extend minimum 2 inches over wall surfaces.
9. Fabricate as much as possible in shop with machinery to eliminate as much hand tooling on the job as possible. Shop fabricate to allow for adjustments in the field for proper anchoring and joining.

2.3 ACCESSORIES

1. Fasteners
    1. Nails: AISI Series 300 for stainless and galvanized steel; aluminum for aluminum sheets. Use annular ring shank type, No. 12 gage or larger to suit application, of sufficient length to penetrate backing material at least 7/8 inch.
    2. Screws and Bolts: AISI Series 300 for stainless and galvanized steel; and aluminum for aluminum sheets; of sufficient size and length to sustain imposed stresses.
2. Protective Back Paint: Zinc chromate alkyd.
3. Sealants: One component polyurethane, non-sagging, sealant as specified in Section 07 92 00.
4. Plastic Cement: FS SS-C-153, Bituminous plastic cement.

2.4 **FINISHES**

1. Aluminum: Pre-finished, color to be selected by Owner, for roof eave, rake edge, gutters, and downspouts.
2. Galvanized Steel: Natural finish. Refer to Section 09 91 00 for field finishing.

PART 3 EXECUTION

3.1 **EXAMINATION**

1. Verify that surfaces and conditions are ready to receive work of this section. Notify General Contractor of any existing conditions, which will adversely affect execution. Beginning of execution will constitute acceptance of existing conditions.
2. Verify roof openings, pipes, sleeves, ducts, and vents through roof are solidly set, cant strips and reglets in place, and nailing strips located.
3. Verify membrane termination and base flashings are in place, sealed, and secure.

3.2 **PREPARATION**

1. Field measure site conditions prior to fabricating work.

3.3 INSTALLATION

1. Install using skilled workmen in accordance with manufacturer's printed instruction and recommendations.
2. Conform to drawing details included in manuals published by AA and NRCA.
3. Secure flashings in place using concealed fasteners. Use exposed fasteners only in locations approved by Architect and Owner.
4. Lap roof eave flashings 4" and seal all joints.

5. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
6. Seal metal joints watertight at gutters and downspouts.
7. All wall fasteners shall be sealed with appropriate exterior sealant. Holes shall be filled prior to fastener installation.
8. Provide electrolytic separation between dissimilar metals with protective back paint.
9. On soldered metal joints, make watertight for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.
10. Install expansion joints at frequency as recommended in SMACNA Architectural Sheet Metal Manual. Do not fasten seams such that movement is restricted. Coordinate E.J. locations with joints in adjacent materials.
11. If approved by Owner, as an alternate to soldered joints, sheet metal joints may be lapped 6" and a double bead of sealant used to seal joint watertight. Soldered joints must be maintained, however, at all formed corners, column wraps, and sill pockets for wall openings.

3.4 QUALITY CONTROL

1. Install surfaces flat such that from normal viewing distances, no waviness or oil canning is visible.

3.5 CLEANING

1. Perform final cleaning under provisions of Section 01 77 00.

3.6 **PROTECTION**

1. Protect finished installation under provisions of Section 01 50 00.

END OF SECTION

SECTION 07 65 00

FLEXIBLE AND MANUFACTURED FLASHING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section Includes:
   1. Elastomeric wall flashing for horizontal surfaces and at window sills.
   2. Pre-manufactured flashing units.

1.2 SUBMITTALS

A. Manufacturer's Product Data: Submit current catalog data, including typical details and other technical data pertaining to flexible flashing products.

B. Manufacturer's Installation Instruction: Submit current installation instructions and recommendations for applications as on Project.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Waterproofing underlayment shall be listed by the governing model code authority, as evidenced by a current ICBO Evaluation Service (ICBO ES) Research Report or CABO National Evaluation Service Report (NER), as acceptable to authorities having jurisdiction.

1.4 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver materials in manufacturer's original, unopened packaging with all labels intact.

B. Storage and Protection: Comply with manufacturer's instructions and recommendations. Protect products from freezing and hot temperatures. Store only as much material at point of use as required for each day's work.

PART 2 - PRODUCTS

2.1 ELASTOMERIC WALL FLASHING

A. Vycor Plus by W.R. Grace & Company, self-sealing, self-healing, fully-adhered, composite flexible flashing, consisting of 36 mils of rubberized asphalt compound integrally bonded to a 4 mil, high density, and cross-laminated polyethylene film.
   1. Acceptable Manufacturers: Subject to compliance with requirements, provide products as manufactured by one of the following:
      a. WR Grace.
      b. WR Meadows

B. Perm-A-Barrier Wall Flashing manufactured by Grace Construction Products, 0.8 mm (32 mils) of self-adhesive rubberized asphalt integrally bonded to 0.2 mm (8 mils) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed.
   1. Acceptable Manufacturers: Subject to compliance with requirements, provide products as manufactured by one of the following:
      a. WR Grace.
      b. WR Meadows

C. Window and Door Flashing: Refer to Section 072500.

2.2 PREMANUFACTURED FLASHING PANELS

A. Acceptable Manufacturer: Quickflash Weatherproofing Products, Inc., 4129 Wagon Trail Avenue, Las Vegas, Nevada 89118. Phone (702) 614-6100. Fax (702) 614-4090. Website www.quickflashproducts.com. E-mail contact@quickflashproducts.com.

B. Flashing Panels: Quickflash Weatherproofing Flashing Panels.

C. Materials:
1. Panel: Combination of high-density polyethylene (HDPE) and low-density polyethylene (LDPE).
   a. HDPE, Specific Gravity, ASTM D 1505: 0.953 g/cm^3.
   b. HDPE, Tensile Strength at Yield, ASTM D 638: 3,100 psi.
   c. LDPE, Specific Gravity, ASTM D 792: 0.917 g/cm^3.
   d. LDPE, Tensile Strength at Yield, ASTM D 638: 1,300 psi.
2. Weatherproof Seal: Thermoplastic elastomer.
   a. Hardness, ASTM D 2240, Shore A, 10 Seconds: 46.
   b. Specific Gravity, ASTM D 792: 1.05 g/cm^3.
   c. Tensile Strength, ASTM D 412: 490 psi.

D. Products: As selected by Architect and as recommended by manufacturer for application.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELASTOMERIC WALL FLASHING

A. Installation of Elastomeric Wall Flashing: Comply with manufacturer's instructions and recommendations, to suit conditions of the project, for preparation, installation and finishing of elastomeric/wall flashing. Self-adhering membrane to lap shingle style with building paper of metal flashing to direct water away from building.
1. Apply surface conditioner to substrate surfaces, as required by elastomeric flashing manufacturer. Allow surface conditioner to dry before proceeding with elastomeric flashing installation.
2. Precut pieces of elastomeric flashing to facilitate handling.
3. Remove release paper and position elastomeric flashing carefully before placing against substrate.
4. When properly positioned, place elastomeric flashing again substrate and press firmly into place by hand roller or blunt object such as back utility knife. Ensure that flexible flashing is fully adhered to substrate to prevent water from migrating up under flashing.
5. Overlap adjacent pieces minimum 2-inches and roll all overlaps with steel hand roller or blunt object.
6. Trim bottom edge of elastomeric flashing back ½-inch from exposed face of building.
7. At heads, sills and other horizontal terminations of flashing, turn up ends minimum of 2-inches, cut and make careful folds to form a pan and seal with elastomeric mastic as recommended by flashing manufacturer.

B. Sealing: Apply bead or trowel coat of elastomeric mastic along top edges, seam, cuts and penetrations. Seal all penetrations through elastomeric flashing.

3.2 INSTALLATION OF WINDOW FLASHING

A. Refer to Section 072500.

3.3 INSTALLATION OF PREMANUFACTURED FLASHING PANELS

A. Install flashing panels in accordance with manufacturer's instructions.

B. Plumbing Flashing Panels, 1 Piece:
   1. Select flashing panel required for specific pipe sizes.
   2. Push flashing panel over pipe with label facing to exterior to form weatherproof seal around pipe.
   3. Nail flashing panels to walls with corrosion-resistant nails at top of panels.

C. Plumbing Flashing Panels, 2 Piece:
   1. Cut flashing panel scores to size of pipe.
   2. Place bottom panel under pipe.
   3. Snap top panel to bottom panel over pipe.
   4. Caulk pipe to flashing panel with exterior polyurethane joint sealant for weatherproof seal.

D. Electrical Flashing Panels:
   1. Select flashing panel required for specific electrical boxes.
   2. Push flashing panel over electrical box with label facing to exterior to form weatherproof seal around box.
   3. Ensure flashing panel collar edge is flush with electrical box opening edge.

E. Weather Barriers:
   1. Place weather barrier up behind bottom of flashing panel to bottom of pipe or electrical box.
   2. Place second layer of weather barrier over top of flashing panel to bottom front edge or further down.

F. Dryer and exhaust vents:
   1. Cut building wrap neatly around penetrations and tape.

3.4 PROTECTION

A. Protection: Perform protective measures as recommended and required by elastomeric flashing manufacturer, to prevent mechanical damage and deterioration from ultra-violet (sun) exposure.

END OF SECTION

SECTION 07 72 00

ROOF ACCESSORIES

SECTION 07 72 00 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Roof curbs.
2. Equipment supports.
3. Roof walkways.
4. Roof Access Ladder.

1.2 SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.

C. Coordination Drawings: Roof plans drawn to scale and coordinating penetrations and roof-mounted items.

D. Samples: For each exposed finish.

1.3 QUALITY ASSURANCE

A. Standards: Comply with the following:

1. SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.
2. NRCA's "Roofing and Waterproofing Manual" details for installing units.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum:

1. Sheet: ASTM B 209 (ASTM B 209M) for alclad alloy 3005H25 or alloy and temper required to suit forming operations, with mill finish, unless otherwise indicated.
2. Extrusions: ASTM B 221 (ASTM B 221M) alloy 6063-T52 or alloy and temper required to suit structural and finish requirements, with mill finish, unless otherwise indicated.

B. Galvanized Steel Sheet: ASTM A 653/A 653M with G90 (Z275); commercial steel, unless otherwise indicated.

1. Structural Quality: Grade 40 (Grade 275), where indicated or as required for strength.

C. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M with Class AZ-50 (AZ-150) coating, structural quality, Grade 40 (Grade 275), or as required for strength.

D. Insulation: Manufacturer's standard rigid or semirigid glass-fiber board of thickness indicated.

E. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, complying with AWPA C2; not less than 1-1/2 inches (38 mm) thick.

F. Security Grilles: 3/4-inch- (19-mm-) diameter, hardened steel bars spaced 6 inches (150 mm) o.c. in one direction and 12 inches (300 mm) o.c. in other. Weld bar intersections and ends of bars to structural frame or primary curb walls. Clean and paint with rust-inhibitive metal primer.

G. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by manufacturer. Match finish of exposed fasteners with finish of material being fastened.

1. Provide nonremovable fastener heads.

H. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.

I. Bituminous Coating: SSPC-Paint 12, solvent-type bituminous mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil (0.4-mm) dry film thickness per coating.

J. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

K. Elastomeric Sealant: Recommended by unit manufacturer that is compatible with joint surfaces; ASTM C 920, Type S, Grade NS, Class 25.

L. Roofing Cement: ASTM D 4586, nonasbestos, fibrated asphalt cement designed for trowel application or other adhesive compatible with roofing system.

2.2 ROOF CURBS AND EQUIPMENT SUPPORTS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AES Industries, Inc.
2. Colony Custom Curbs.
3. Commodity Products Company, Inc.
4. Conn-Fab Sales, Inc.
5. Curbs Plus, Inc.
6. Custom Curb, Inc.
7. Gieske Custom Metal Fabricators.
8. Goeller Enterprises.
9. LMCurbs.

10. Loren Cook Company.
11. Metallic Products Corporation.
12. Pate Co. (The).
13. Roof Products & Systems Corp.
14. ThyCurb, Inc.
15. Uni-Curb, Inc.
16. Vent Products Co., Inc.

C. General: Units capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported. Coordinate dimensions with equipment to be supported.

1. Provide preservative-treated wood nailers at tops of units and formed flange at perimeter bottom for mounting to roof.
2. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
3. Fabricate units to minimum height of 8 inches (200 mm), unless otherwise indicated.
4. Where slope of roof deck exceeds 1/4 inch per foot (1:48), fabricate support units with height tapered to match slope to level tops of units.

D. Roof Curbs:

1. Fabrication: Unless otherwise indicated or required for strength, fabricate units from minimum 0.0747-inch- (1.9-mm-) thick, structural-quality, hot-dip galvanized or aluminum-zinc alloy-coated steel sheet; factory primed and prepared for painting with welded or sealed mechanical corner joints.
2. Fabrication: Unless otherwise indicated or required for strength, fabricate units from minimum 0.063-inch- (1.6-mm-) thick, sheet aluminum with welded corner joints.
3. Insulation: Manufacturer's standard rigid or semirigid insulation where indicated.
4. Cants: Formed cants and base profile coordinated with roof insulation thickness.

E. Equipment Supports: Capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported. Coordinate dimensions with equipment to be supported.

1. Fabrication: Unless otherwise indicated or required for strength, fabricate units from minimum 0.0747-inch- (1.9-mm-) thick, structural-quality, hot-dip galvanized or aluminum-zinc alloy-coated steel sheet; factory primed and prepared for painting with welded or sealed mechanical corner joints.
2. Fabrication: Unless otherwise indicated or required for strength, fabricate units from minimum 0.063-inch- (1.6-mm-) thick, sheet aluminum with welded corner joints.

2.3 ROOF WALKWAYS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Firestone Building Products, LLC
2. Flex Membrane International
3. FAF: EverGuard Extreme TPO 50mil.

4. Carlisle – Sure Weld TPO Walkway
5. Substitutions: See Section 01 60 00 products

C. TPO Walkway: TPO Walkway Pad is a walkway made of flexible thermoplastic polyolefin and produced with a polyester weft inserted reinforcement. It has a white, textured, slip-resistant top surface and a smooth bottom surface. Installation of Walkway Pads is required to protect the roofing system from damage in areas with intensive rooftop traffic (hatches, doorways, ladders, roofs subject to periodic traffic for maintenance of technical equipment, etc...)

1. Material: 3.9mm thick Thermoplastic Polyolefin (White)

2.4 ROOF LADDER

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ALACO Fixed Wall Ladders

a. Basic Use: Model 561SE fixed wall, side exit ladders provide permanent exterior roof access.
b. Construction & Materials: ALACO aluminum ladders and their components are fabricated from 6061-T6 aluminum alloy for added safety, strength and long-lasting durability, with no painting required. Model 561SE accessories include the following items:
   1) Cages - These cages consist of 1/4" x 2" (6.4 x 51 mm) hoops and seven 3/16" x 1-1/2" (4.8 x 38 mm) vertical bars, with solid riveted connections.
   2) Rest Platform - These platforms consist of GripStrut® floors, 4" (102 mm) high toe boards, 1-1/4" (32 mm) round serrated tube guard railings and cast aluminum railing fittings.
   3) Security Doors - These doors are fabricated from 0.188" (4.8 mm) thick aluminum sheets, with securing piano hinges and hasps.
c. Note - Cages are required for wall ladders when installations are in excess of 20' (6.1 m) in height. Platforms are required for ladders over 30' (9.2 m).

2. TYPE: Fixed Wall Ladders- Model 561SE- Side Exit

3. SIZES Height- Exceeding 20' (6.1 m) installed with cage; over 30' (9.2 m) installed with cages and rest platforms.

4. WIDTH- 20-1/4"

5. FINISHES & COATINGS: Mill finish aluminum.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Coordinate installation of roof accessories with installation of roof deck, roof insulation, flashing, roofing membranes, penetrations, equipment, and other construction to ensure that

combined elements are waterproof and weathertight. Anchor roof accessories securely to supporting structural substrates so they are capable of withstanding lateral and thermal stresses, and inward and outward loading pressures.

B. Install roof accessory items according to construction details in NRCA's "Roofing and Waterproofing Manual," unless otherwise indicated,

C. Separation: Separate metal from incompatible metal or corrosive substrates, including wood, by coating concealed surfaces, at locations of contact, with bituminous coating or providing other permanent separation.

D. Flange Seals: Unless otherwise indicated, set flanges of accessory units in a thick bed of roofing cement to form seal.

E. Cap Flashing: Where required as component of accessory, install cap flashing to provide waterproof overlap with roofing or roof flashing (as counterflashing). Seal overlap with thick bead of mastic sealant.

F. Operational Units: Test-operate units with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.

G. Heat-and-Smoke Vents: Locate, install, and test according to NFPA 204M.

H. Snow Guards: Install according to manufacturer's written recommendations and NRCA's "Steep Roofing Manual." Unless otherwise indicated, locate snow guards at 18 inches (450 mm) o.c. horizontally, and at every other course vertically, beginning 24 inches (600 mm) up from gutter. Stagger snow guard location by 9 inches (225 mm) between courses.

I. Clean exposed surfaces according to manufacturer's written instructions. Touch up damaged metal coatings.

END OF SECTION

SECTION 07 84 00

PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Penetration firestopping for penetrations through fire-resistance-rated construction as indicated on Drawings.

1.2 PERFORMANCE REQUIREMENTS

A. General: For penetrations through the following fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide penetration firestopping that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
   1. Fire-resistance-rated walls.
   2. Fire-resistance-rated horizontal assemblies.

B. Rated Systems: Provide penetration firestopping with the following ratings determined per ASTM E 814 or UL 1479:
   1. F-Rated Systems: Provide penetration firestopping with F-ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
   2. T-Rated Systems: For the following conditions, provide penetration firestopping with T-ratings indicated, as well as F-ratings, as determined per ASTM E 814, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
      a. Penetrations located outside wall cavities.
      b. Penetrations located outside fire-resistance shaft enclosures.

C. For penetration firestopping exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction. Firestopping to match adjacent surfaces in color or be paintable.
   1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant penetration firestopping.
   2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved either by installing floor plates or by other means.
   3. For penetrations involving insulated piping, provide penetration firestopping not requiring removal of insulation.

D. For penetration firestopping exposed to view, provide products with flame-spread ratings of less than 25 and smoke-developed ratings of less than 450, as determined per ASTM E 84.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer’s literature for each type of through-penetration firestop system product indicated.

B. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.
   1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
   2. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

C. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:
   1. Types of penetrating items.
   2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
   3. Penetration firestopping for each location identified by firestop design designation of qualified testing and inspecting agency.

D. Qualification Data: For installer.

E. Product Certificates: Signed by manufacturers of through-penetration firestop system products certifying that products furnished comply with requirements.

F. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Minimum 5 years experience with firestop systems similar in material, design, and extent to that indicated for this and a firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors."

B. Installation Responsibility: Assign installation of penetration firestopping in Project to a single qualified installer. Splitting this responsibility to individual subcontractors is not acceptable.

C. Source Limitations: Obtain penetration firestopping, for each kind of penetration and construction condition indicated, from a single manufacturer.

D. Fire-Test-Response Characteristics: Provide penetration firestopping that comply with the following requirements and those specified in "Performance Requirements" Article:
   1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or Warnock Hersey or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
   2. Penetration firestopping are identical to those tested per ASTM E 814. Provide rated systems complying with the following requirements:.
      a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
      b. Penetration firestopping correspond to those indicated by reference to through-penetration firestop system designations listed by the following:
         1) UL in "Fire Resistance Directory."
         2) ITS in "Directory of Listed Products."

3) Warnock Hersey

E. Pre-Installation Conference:
1. Convene a pre-installation conference to review specifications and procedures with the Architect, Contractor, installer, manufacturer's representative, Owner and other trades relevant to the work, prior to ordering materials.
2. Notify Architect at least 48 hours prior to starting Work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.

B. Store and handle materials for penetration firestopping to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

1.7 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

C. Notify Owner's inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Hilti Construction Chemicals, Inc.
2. Isolatek International.
3. Nelson Firestop Products.
4. Specified Technologies Inc.
5. 3M; Fire Protection Products Division.
6. Tremco; Sealant/Weatherproofing Division.
7. W.R. Grace Construction

2.2 MATERIALS

A. General:
   1. Compatibility: Provide penetration firestopping that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating penetration firestopping, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Fill Materials:
   1. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
   2. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
   3. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
   4. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.
   5. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
   6. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets.
   7. Mortars: Prepackaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
   8. Pillows/Bags: Reusable, heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.
   9. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
   10. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
       a. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
       b. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
       c. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.

C. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by the qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:
   1. Permanent forming/damming/backing materials, including the following:
      a. Slag-/rock-wool-fiber insulation.
      b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
      c. Fire-rated form board.
      d. Fillers for sealants.
   2. Temporary forming materials.
   3. Substrate primers.
   4. Collars.
   5. Steel sleeves.

D. Fire Safing Insulation: ASTM C24, E119 and E136. Thickness shall be as required by the Manufacturer to provide a fire rating equal to that of the assembly of which it is a part. Where smoke stop protection also is required, install Thermafiber SmokeSeal Caulking Compound as needed to meet UL Standard 1479 and ASTM E814 procedure.

2.3 MIXING

A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with firestop system manufacturer's written instructions and with the following requirements:
   1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
   2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 INSTALLATION

A. General: Install penetration firestopping to comply with "Performance Requirements" Article and firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
   1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for firestop systems by proven techniques to produce the following results:
   1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
   2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
   3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

D. Fire Safing Insulation: Install in proper sizes on safing clips as needed but not to exceed 24 inches O.C. Leave no voids between walls and edges of slabs.

3.4 IDENTIFICATION

A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:
   1. The words: "Warning--Through-Penetration Firestop System--Do Not Disturb. Notify Building Management of Any Damage."
   2. Contractor's name, address, and phone number.
   3. Through-penetration firestop system designation of applicable testing and inspecting agency.
   4. Date of installation.
   5. Through-penetration firestop system manufacturer's name.
   6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified independent inspecting agency to inspect penetration firestopping and to prepare test reports.
   1. Inspecting agency will state in each report whether inspected penetration firestopping comply with or deviate from requirements.

B. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued.

C. Where deficiencies are found, repair or replace penetration firestopping so they comply with requirements.

3.6 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure penetration firestopping are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated penetration firestopping immediately and install new materials to produce penetration firestopping complying with specified requirements.

3.7 SCHEDULE OF PENETRATIONS

A. Schedule: As indicated on Drawings.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Interior and Exterior sealant joints.

1.2 SUBMITTALS

A. Product Data: Manufacturer's literature for each joint-sealant product indicated, including installation instructions.

B. Samples: Submit one sample for each type and color of joint sealant required. Samples shall be installed in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

C. Shop Drawings: Illustrations in sufficient detail to show installation and interface of the work of this Section with the work of adjacent trades. Drawings shall indicate type of sealant scheduled to be used at each type of joint condition.

D. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.

E. Qualification Data: Submit data indicating capabilities and experience for installers. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. Field Test Report: Submit copies of logs and test reports showing results of field adhesion testing and stain testing.

G. Compatibility and Adhesion Test Reports: Submit reports from sealant manufacturer indicating:
   1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
   2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

H. Product Test Reports: From a qualified testing agency indicating sealants comply with requirements, based on comprehensive testing of current product formulations.

I. Warranties: Submit sample warranty to be signed jointly by applicator and manufacturer.

1.3 QUALITY ASSURANCE

A. Qualifications: Installer shall be experienced with project similar in material, design, and extent to those indicated for this Project and shall be approved by sealant manufacturer.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
   1. If sealants from separate manufacturers must be used and could come in contact with each other, provide written certification from every manufacturer involved that the sealants are compatible and will adhere to each other.

C. Preconstruction Compatibility and Adhesion Testing:
   1. Use manufacturers standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
      a. Perform tests under environmental conditions replicating those that will exist during installation.
   2. Submit a minimum of 9 pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
   3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   4. At locations where materials fail tests, obtain joint sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.

D. Product Testing: Submitted test results shall be from a qualified testing agency based on testing current sealant formulations within a 36-month period.
   1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
   2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
   3. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in peel, and indentation hardness.
   4. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.

E. Preconstruction Field-Adhesion Testing: Before installing sealants, perform adhesion field tests for each type of sealant and joint substrate indicated.
   1. Locate test joints where indicated or, if not indicated, as directed by Architect.
   2. Notify Architect seven days in advance of dates and times when test joints will be erected.
   3. Arrange for tests to take place with joint sealant manufacturer's technical representative present.
   4. Test Method: Test joint sealants by hand-pull method described below:
      a. Install joint sealants in 60-inch- long joints using same materials and methods for joint preparation and joint-sealant installation required for the completed Work. Allow sealants to cure fully before testing.
      b. Make knife cuts from one side of joint to the other, followed by two cuts approximately 2 inches long at sides of joint and meeting cross cut at one end. Place a mark 1 inch from cross-cut end of 2-inch piece.
      c. Use fingers to grasp 2-inch piece of sealant between cross-cut end and 1-inch mark; pull firmly at a 90-degree angle or more in direction of side cuts while holding a ruler along side of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.
      d. For joints with dissimilar substrates, check adhesion to each substrate separately by extending cut along one side, checking adhesion to opposite side, and then repeating this procedure for opposite side.
   5. Conduct number of field adhesion tests for each type of sealant and each type of substrate as follows:
      a. Not less than 10 tests for the first 1,000 feet of installed sealant and 1 test for each additional 1,000 feet of sealant installed, or 1 test per floor per elevation.
   6. Document results of field adhesion tests and record results in field adhesion test log.
   7. Include in log data on pull distance used to test each joint sealant.
   8. Include data on joints where material connected with pull portion of sealant failed to adhere to joint substrate or tore cohesively.

9. Inspect joints and record data for the following:
    a. Complete fill.
    b. No voids.
    c. Joint dimensions matching those of manufacturer's recommended details.
10. Report whether sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
11. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.
12. Repair sealant test areas by removing damaged materials and applying sealant to test area using same procedure used to originally install the sealant.

F. Stain Testing: Perform Stain testing of stone, masonry and other porous substrates proposed for use in the Work. Obtain actual samples of materials proposed for use and test to determine if permanent discoloration of porous surfaces will occur from direct contact with sealants. Perform stain testing in conformance with ASTM C1248 and as follows:
1. Notify Architect at commencement of stain testing procedure.
2. Arrange for manufacturer's field technical representative and Architect to be present during examination of test results.
3. Cut substrate to provide flat surface for application of sealant.
4. Separate substrate materials by removable shims to create 1/2 x 1/2 x 3 inch joint.
5. Fill joint with scheduled sealant, tool, and allow to cure for 21 days at room temperature.
6. After 21 day curing, remove shims, compress joint to 50 percent of original joint width to 1/4 inch, and place in an oven at 158 degrees F. for 14 days.
7. After 14 days in oven, remove and allow sample to cool to room temperature.
8. Examine sample to determine presence of discoloration or change in appearance in any way to exposed surfaces.
9. After visual inspection, cut sample in half to determine presence of discoloration or change in appearance in any way into the sample itself at the adhesive bond line and presence of bleeding into the area around the adhesive bond line.
10. Document results of stain tests and record results in stain test log.
11. Do not install sealants that show evidence of staining substrates.

G. Field Color and Workmanship Samples: Caulk a section of joint as directed, under job conditions, at least 7 days prior to start of work for review by Architect. When approved, sample shall be used as a standard of comparison for remainder of work.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.5 PROJECT CONDITIONS

A. Project Requirements: Do not install when weather conditions or substrate conditions are not acceptable to manufacturer.
1. Ambient and substrate temperature conditions shall be within limits as recommended by sealant manufacturer.

2. Joint widths shall be at least the minimum width allowed by sealant manufacturer and as recommended by Structural Engineer.

1.6 WARRANTY

A. Installer's Warranty: Written warranty, signed by Installer agreeing to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: 1 years from date of Substantial Completion.

B. Manufacturer's Warranty: Written warranty, signed by elastomeric sealant manufacturer agreeing to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period:
      a. Urethane Sealants: 1 year from date of Substantial Completion.
      b. Silicone Sealants: 1 year from date of Substantial Completion.
      c. Others: 1 year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide products as manufactured by one of the following:
   1. Pecora Corporation.
   2. Tremco Vulkem.
   3. Dow Corning Corporation.
   4. General Electric.
   5. Sika Corporation.
   6. Sonneborn / CDegusa.

2.2 MATERIALS

A. General: The selection of proper sealant for a particular joint shall be in accordance with current published recommendations of the manufacturer.

B. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range for this characteristic.

2.3 JOINT SEALANTS

A. Elastomeric Joint Sealants: Comply with ASTM C 920 and other requirements indicated.
   1. Additional Movement Capability: Where additional movement capability is specified in the Elastomeric Joint-Sealant Schedule, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at the time of installation and remain in compliance with other requirements of ASTM C 920 for uses indicated.

2. Continuous-Immersion-Test-Response Characteristics: Where elastomeric sealants will be immersed continuously in water, provide products that have undergone testing according to ASTM C 1247, including initial six-week immersion period and additional immersion periods specified below, and have not failed in adhesion or cohesion when tested with substrates indicated for Project.
   a. Sealant must cure a minimum of 7 days before submersion.
3. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food; provide products that comply with 21 CFR 177.2600.

B. Solvent-Release Joint Sealants:
1. Acrylic-Based Solvent-Release Joint-Sealant: Comply with ASTM C 1311.
2. Pigmented Narrow Joint Sealant: Provide manufacturer's standard, solvent-release-curing, pigmented, synthetic-rubber sealant complying with AAMA 803.3 and formulated for sealing joints 3/16 inch or smaller in width.

C. Acoustical Joint Sealants:
1. Acoustical Sealant for Exposed and Concealed Joints: Provide manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:
   a. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
2. Acoustical Sealant for Concealed Joints: Provide manufacturer's standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

2.4 ACCESSORIES

A. Joint Sealant Backing: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
1. Cylindrical Sealant Backings: ASTM C 1330, provide one of the following, of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
   a. Type O: Open-cell material.
      1) Product: Pecora #91 Open Cell Backer Rod.
   b. Type C: Closed-cell material with a surface skin.
      1) Product: Pecora #92 Closed Cell Backer Rod.
   c. Type B: Bicellular material with a surface skin.
      1) Product: Sof Rod by Nomaco or Pecora #93 Soft Foam Backer Rod.
2. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
3. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

B. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

C. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.

D. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
   1. Substrates shall be dry and free of contaminants.
   2. Report unsatisfactory conditions to Architect in writing.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:
   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
      a. Porous joint substrates: Clean surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining by vacuuming or blowing out joints with oil-free compressed air.
      b. Nonporous joint substrates: Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
      c. Concrete: Remove laitance and form-release agents from concrete.

B. Joint Priming: Prime joint substrates where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Standards:
   1. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
   2. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and back of joints.

E. Install sealants to comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses provided for each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   1. Remove excess sealants from surfaces adjacent to joint.
   2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

B. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

3.6 JOINT-SEALANT SCHEDULE

A. Horizontal traffic:

1. Type: 2-part or 3-part (self-leveling) urethane, Type M, Grade P, Class 25, Use T.
2. Conforming to ASTM C920
3. Acceptable Products: Subject to compliance with requirements, provide one of the following products:
    a. Pecora NR-200 Urexpan Sealant (Self-leveling) or Dynatred (non-sag)
    b. Tremco THC-900/901
    c. Vulkem 245
    d. Sikaflex 2c SL (self-leveling)
    e. Sonneborn SL-2.
4. Hot Pour

B. Masonry, concrete to concrete, steel and wood:
1. Type: 3-part chemically curing polyurethane sealant, Type M, Grade NS, Class 25, Use NT, M, A, O.
2. Conforming to ASTM C920
3. Movement: 50 percent in extension and compression, and sustained temperatures of 250 degrees F in service
4. Acceptable Products: Subject to compliance with requirements, provide one of the following products:
    a. Tremco Dymeric 240/240FC Sealant
    b. Pecora Dynatrol II
    c. Dymeric 240
    d. Sonneborn NP-2.

C. Glass (except insulating glass or special coated glass), aluminum, Natural Stone, and plastics:
1. Type: One-part low modulus moisture cure silicone rubber sealant, Class A, Type S, Grade NS, Class 25, Use NT, M, G, A, and O.
2. Conforming to ASTM C920.
3. Movement: 100 percent in extension and 50 percent in compression in service.
4. Acceptable Products: Subject to compliance with requirements, provide one of the following products:
    a. Dow Corning 790 Silicone Glazing Sealant
    b. Tremco Spectrem 1
    c. Pecora 890 Silicone Sealant or Pecora 890FTS Field Tintable Silicone Sealant.
    d. SikaSil C-990.

D. Glass (including insulating glass or special coated glass), aluminum and plastics:
1. Type: One-part medium modulus neutral cure silicone rubber sealant, Type S, Grade NS, Class 25, Use NT, M, G, A, and O.
2. Conforming to ASTM C 920
3. Movement of 50 percent in extension and 50 percent in compression in service.
4. Acceptable Products: Subject to compliance with requirements, provide one of the following products:
    a. Tremco Spectrem 2
    b. Pecora 895 Silicone Glazing and Weatherproofing Sealant.
    c. Dow Corning 795
    d. Dow Corning 791
    e. GE Silpruf or 4000 Series as recommended by manufacturer.
    f. SikaSil C-995

E. Concrete to concrete, stucco, masonry, aluminum, steel, and wood and Mechanical (ductwork and air conditioning):
1. Type: Type S, Grade NS, Class 25, Use NT, M, A, O.
2. Conforming to ASTM C920
3. Acceptable Products: Subject to compliance with requirements, provide one of the following products:

a. Sika Sikaflex 1A
b. Pecora Dynatrol 1-XL
c. Tremco DyMonic FC
d. Sonneborn NP-1.
e. Vulkem 921.

F. Plumbing Fixtures (around toilet, bath and kitchen fixtures):
1. Type: Silicone rubber sealant with mold inhibitor.
2. Acceptable Products: Subject to compliance with requirements, provide one of the following products:
a. General Electric Sanitary 1700
b. Tremco Proglaze or Tremsil 200
c. Dow Corning 999
d. Pecora 860 or 898
e. Sonneborn Omni-Plus.

G. Acoustical Sealant:
1. Exposed and Concealed Joints:
a. Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834
b. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
c. Acceptable Products: Subject to compliance with requirements, provide one of the following products:
1) Tremco, Tremflex 834.
2) Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
3) United States Gypsum Co.; SHEETROCK Acoustical Sealant.
2. Concealed Joints: Manufacturer's standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.
a. Acceptable Products: Subject to compliance with requirements, provide one of the following products:
1) Pecora Corporation; BA-98.
2) Tremco; Tremco Acoustical Sealant.

END OF SECTION

SECTION 08 11 10

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Steel doors.
   2. Steel door frames.
   3. Fire-rated door and frame assemblies.

1.2 SUBMITTALS

A. Product Data: Submit elevations or each type of door and frame indicated, including door designation, type, level and model, material description, core description, construction details, label compliance, sound and fire-resistance ratings, and finishes.
   1. Fire Rated Doors and Frames: Submit installation instructions identifying the hardware products, other materials and work requirements necessary to maintain compliance with UL 10(c) (positive pressure testing as required by IBC 2015 Section 715 for fire Tests of Door Assemblies.

B. Shop Drawings: Submit Drawings showing location and installation requirements for hardware.

C. Door Schedule: Use same reference designations indicated on Drawings in preparing schedule for doors and frames.

D. Certification: Submit certification that fire rated doors (including frames and hardware as a unit) will comply with UL 10(c) (positive pressure testing) as required by IBC Section 715 for Fire Tests of Door Assemblies.

1.3 QUALITY ASSURANCE

A. Steel Door and Frame Standard: Comply with ANSI A 250.8, unless more stringent requirements are indicated.

B. Fire-Rated Door Assemblies: Assemblies shall comply with NFPA 80.
   1. Test Pressure: Test at atmospheric pressure.
   2. Temperature-Rise Rating: Where indicated, provide doors that have a temperature-rise rating of 450 deg F maximum in 30 minutes of fire exposure.

C. Single Source: Provide doors and frames from a single manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection as required to prevent damage to finish of factory-finished doors and frames.

B. Deliver welded frames with spreaders.

C. Store doors and frames at building site under cover. Place units on minimum 4-inch- high wood blocking. Nonvented plastic or canvas shelters shall not be used for cover. If door packaging

becomes wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to avoid metal to metal contact and to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products as manufactured by one of the following:
   1. Therma-Tru
   2. Masonite.
   3. Ceco Door Products; a United Dominion Company.
   4. Curries Company.
   5. Kewanee Corporation (The).
   6. Republic Builders Products.
   7. Steelcraft; a division of Ingersoll-Rand.
   8. Premdor

2.2 MATERIALS

A. Hot-Rolled Steel Sheets: ASTM A 569, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

B. Cold-Rolled Steel Sheets: ASTM A 366, Commercial Steel (CS), or ASTM A 620, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.

C. Metallic-Coated Steel Sheets: ASTM A 653, Commercial Steel (CS), Type B, with an A40 zinc-iron-alloy (galvannealed) coating; stretcher-leveled standard of flatness.

2.3 DOOR AND FRAMES

A. Doors: Provide doors complying with requirements indicated below by referencing ANSI 250.8 for level and model and ANSI A250.4 for physical-endurance level:
   1. Level 2 and Physical Performance Level B (Heavy Duty), Model 2 (Seamless), 18 gauge cold-rolled steel.

B. Frames: Conforming to ANSIA250.8/SDI100.
   1. Interior: Fabricated from 18 gauge steel.
   2. Exterior: Fabricated from 16 gauge steel.

C. Core Construction: One of the following manufacturer's standard core materials that produce a door complying with SDI standards:
   1. Interior: Resin-impregnated kraft/paper honeycomb.
   2. Exterior: Polyurethane or Polystyrene with vertical steel stiffeners.
   3. Fire Door Cores: Core shall be as allowed by UL 10(c).

D. French Style Doors: Configuration as indicated on Drawings.

2.4 ACCESSORIES

A. Door Silencers: Except on weather-stripped frames, fabricate stops to receive three silencers on strike jambs of single-door frames and two silencers on heads of double-door frames.

B. Plaster Guards: Provide 0.016-inch- thick, steel sheet plaster guards or mortar boxes to close off interior of openings; place at back of hardware cutouts where mortar or other materials might obstruct hardware operation.

C. Supports and Anchors: Fabricated from 18 gauge, electrolytic zinc-coated or metallic-coated steel sheet.

D. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A 153, Class C or D as applicable.

E. Door Louvers: Provide louvers for interior doors, where indicated, that comply with SDI 111C, with blades or baffles formed of 0.020-inch- thick, cold-rolled steel sheet set into 0.032-inch-thick steel frame.
   1. Sightproof Louvers: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.

F. Vision Lite Systems: Manufacturer's standard kits consisting of glass lite moldings to accommodate glass thickness and size of vision lite indicated.
   1. Glazing Beads: Minimum 20 gauge steel.

G. Astragals: As required by NFPA 80 to provide fire ratings indicated.

H. Prime Finish: Manufacturer's standard, factory-applied coat of rust-inhibiting primer complying with ANSI A250.10 for acceptance criteria.

2.5 FABRICATION

A. General: Fabricate steel door and frame units to comply with ANSI A250.8 and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site.

B. Fabricate concealed stiffeners, reinforcement, edge channels and moldings from either cold- or hot-rolled steel sheet.

C. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.

D. Reinforce top and bottom of doors horizontally by 16 gauge steel channels, full width, spot welded to each face at least 3 inches on center. Bevel edge of lock stile.

E. Accurately mortise doors for locks and hinges. Provide adequate box type reinforcement with steel plates welded to the interior reinforcing channels and drilled and tapped. Provide reinforcement for all other items of hardware.

F. Exterior Doors and Frames:
   1. Fabricate doors, panels, and frames, dripcaps and other accessories from metallic-coated steel sheet.
   2. Close top and bottom edges of doors flush as an integral part of door construction or by addition of 16 gauge, metallic-coated steel channels with channel webs placed even with top and bottom edges.
   3. Secure drip cap to frame of exterior doors.

G. Clearances:

1. Non-Fire-Rated Doors: Not more than 1/8 inch at jambs and heads, except not more than 1/4 inch between pairs of doors. Not more than 3/4 inch at bottom.
2. Fire-Rated Doors: As required by NFPA 80.

H. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

I. Frame Construction: Fabricate frames to shape shown.
1. Fabricate frames with mitered or coped and continuously welded corners and seamless face joints.
2. Provide welded frames with temporary spreader bars.

J. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.
1. For concealed overhead door closers, provide space, cutouts, reinforcement, and provisions for fastening in top rail of doors or head of frames, as applicable.

K. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.

L. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.

M. Reinforce openings in doors for lites and vents on all sides with 14 gauge steel channel.

N. Glazing Stops: Manufacturer's standard, formed from 0.032-inch- thick steel sheet.
1. Provide nonremovable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
2. Provide screw-applied, removable, glazing stops on inside of glass, louvers, and other panels in doors.

2.6 FINISHES

A. Clean frames by degreasing process and apply thorough coating of primer, covering inside and outside surfaces, to receive paint finish as specified in Section 09 91 00 - Painting.
1. Galvanealed Frames: Coat welds and other disrupted surfaces with zinc-rich paint containing not less than 90 percent zinc dust by weight.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.

B. Placing Frames: Comply with provisions in SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
1. Place frames before construction of enclosing walls and ceilings.
2. In metal-stud partitions, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Attach wall anchors to studs with screws.

3. Install fire-rated frames according to NFPA 80.
4. For openings 90 inches or more in height, install an additional anchor at hinge and strike jambs.

C. Door Installation: Comply with ANSI A250.8. Fit hollow-metal doors accurately in frames, within clearances specified in ANSI A250.8. Shim as necessary to comply with SDI 122 and ANSI/DHI A115.1G.
1. Fire-Rated Doors: Install within clearances specified in NFPA 80.

3.2 FIELD QUALITY CONTROL

A. Fire Rated Doors: Manufacturer's representative shall inspect fire rated doors (including frames and hardware as a unit) and verify compliance with UL 10C (positive pressure testing) as required by IBC Section 715 for Fire Tests of Door Assemblies. Fire rated doors (including frames and hardware as a unit) which do not comply with UL 10C (positive pressure testing) as required by IBC Section 715 Fire Tests of Door Assemblies shall be removed and replaced at no additional cost to Owner.

3.3 ADJUSTING AND CLEANING

A. Prime-Coat Touchup: Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of compatible air-drying primer.

B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION

SECTION 08 12 05

ALUMINUM DOOR FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Related Documents:
   1. Provisions established within the General and Supplementary Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.

B. Section Includes:
   1. Aluminum door frames for interior use.
   2. Aluminum door frames with sidelight frame components for interior use.

C. Related Sections:
   1. Section 08211 - Wood Doors.
   2. Section 08710 - Door Hardware.
   4. Section 08800 - Glazing.

1.2 SUBMITTALS

A. Submit under provisions of Section 01330.
B. Product Data: Submit for door, sidelight and frames.
   1. Include color charts for finish indicating manufacturer's standard colors available for selection.
C. Samples: Submit following:
   1. Samples indicating quality of finish in selected colors on alloys used for Work.

1.4 QUALITY ASSURANCE

A. Single Source Responsibility: Provide aluminum frames, aluminum and glass doors, and accessories produced by a single manufacturer for each type of product indicated.
B. Manufacturer’s Qualifications: Manufacturer shall demonstrate previous experience in manufacturing of interior aluminum door framing for a period of not less than 10 years on comparable sized project.
C. Fire and Smoke Rated Assemblies:
   1. Where fire-rated openings are scheduled or required by authorities having jurisdiction, provide fire-rated aluminum frames that have been tested and certified to meet the requirements of Neutral Pressure Fire Test of Door Assemblies for specified exposure by an agency acceptable to governing authorities.
   2. Provide labels permanently fastened on each fire rated frame and door that are within size limits established by NFPA and the testing authority.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver frames and doors in cartons to provide protection during transit and storage at project site.
B. Inspect frames and doors upon delivery for damage.
   1. Repair minor damage to pre-finished products by means as recommended by manufacturer
   2. Replace frames and doors that cannot be satisfactorily repaired.
C. Store frames and doors at project site under cover and as near as possible to final

installation location. Do not use covering material that will cause discoloration of aluminum finish.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not begin installation of frames or doors until area of work has been completely enclosed and interior is protected from the elements.

B. Maintain temperature and humidity in areas of installation within reasonable limits, as close as possible to final occupancy. If necessary, provide temperature control and ventilation to maintain required environmental conditions.

1.7 WARRANTY

A. Warrant against defects in manufacturing of materials for a period of 2 years from date of substantial completion.

B. Warrant framing finish against defects, including cracking, flaking, blistering, peeling, and excessive fading, chalking and non-uniformity in color for a period of 5 years.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS AND PRODUCTS

A. Manufacturers:

1. Meet or exceed standards of manufacture, appearance, performance, function, and design, of:

a. RACO Solutions II

B. Acceptable Products:

1. Interior Door Frames: RACO Solutions II fixed throat frames to accommodate wall thicknesses indicated on Drawings; ceiling height system.

2. Interior Borrowed Light Framing: RACO Solutions II, fixed throat frames to accommodate wall thicknesses indicated on Drawings.

a. Provide non fire rated with adjustable bottom rails for field adjustment.

c. Provide with custom horizontal and vertical mullion pattern as indicated on Drawings

2.2 MATERIALS

A. Aluminum: Meeting requirements of ASTM B221, 6063T5 alloy, and as otherwise required to assure compliance with dimensional tolerances and maintain color uniformity. Billets shall be composed of at least 33% recycled aluminum.

B. Anchorage Devices, Clips and Fasteners: Manufacturer's standard type, compatible with materials being secured.

C. Accessories: As necessary for complete system.

2.3 EXTRUDED ALUMINUM FRAME AND DOOR FABRICATION

A. Assemble all sidelights and windows with the use of clips.

B. Do not exceed maximum size of window or door to meet applicable code requirements.
C. Factory pre-machine door frame jambs [and doors] and prepare for hardware, with concealed reinforcement plates, drilled and tapped as required, and fastened within frame with concealed screws.

2.4 FINISHES
A. Factory finish extruded frame and door components so that all parts exposed to view upon completion of installation are uniform in finish and color. Exposed surfaces shall be free of scratches and other serious blemishes.
B. Factory Applied Paint Finish: Comply with AAMA(2603) 603.8 and AA-DAF-45, factory applied baked enamel coating.

1. Color: As selected from manufacturer's standard colors.

C. Clear Anodized: AA-M12C22A21, etched, medium matte, clear anodic coating.

PART 3 EXECUTION

3.1 EXAMINATION
A. Examine project conditions and verify that project is ready for work of this section to proceed. Do not proceed with installation until unsatisfactory conditions have been corrected.
B. Verify wall thickness does not exceed manufacturer's recommended tolerances of specified throat size.

3.2 INSTALLATION
A. Comply with frame and door manufacturer's printed installation instructions and approved shop drawings. Do not attempt installation in areas where wall thickness exceeds tolerances of specified throat size.
B. Install frames plumb and square, free from warp or twist, securely anchored to substrates with fasteners recommended by frame manufacturer. Maintain dimensional tolerances and alignment with adjacent work. Ensure joints are hairline tight and surfaces flush with adjacent components.
C. Set all doors in correct locations as shown on the drawings, level, square, plumb and in alignment with other work in accordance with the manufacturer's installation instructions and approved shop drawings.
D. Install glass in accordance with Section 08800.

3.3 ADJUSTING AND CLEANING
A. Protect exposed portions of aluminum surfaces from damage by plaster, lime, acid, cement, and other contaminants.
B. Touch up marred areas so that touch-up is not visible from a distance of 4 feet. Remove and replace frames that cannot be satisfactorily adjusted.

3.4 PROTECTION
A. Protect as required to assure that frames and doors will be without damage until Substantial Completion.

END OF SECTION – 08 12 05

SECTION 08 21 11

FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Solid-core doors with Low-Pressure Decorative Laminate (herein referred to as “LPDL”) Thermal Fused faces.
2. Factory fitting flush wood doors to frames and factory machining for hardware.
3. Vision lite kits for flush wood doors.

B. Related Sections include the following:

1. Division 8 Section "Glazing" for glass view panels in flush wood doors.

1.3 SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction and trim for openings.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate fire ratings for fire doors.

C. Samples for Initial Selection: Color samples consisting of actual faces in small sections for the following:

1. LPDL Thermal Fused Door Faces: Show the full range of colors and wood grains available.

D. Samples for Verification:
1. Hinge corner sections of LPDL Thermal Fused doors, approximately 5 by 11 inches for each color or wood grain specified.
2. Frames for lite openings, 6 inches long, for each material, type, and finish required.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified independent third party testing agency, for doors, showing compliance with specified performance requirements and physical properties.

SECTION 08 21 11

FLUSH WOOD DOORS

QUALITY ASSURANCE

A. Source Limitations: Obtain LPDL Thermal Fused Flush Wood Doors through one source from a single manufacturer.

B. Quality Standard: Comply with WDMA I.S.1-A, 2004 edition "Industry Standard for Architectural Wood Flush Doors" and the following minimum values (for particle core doors):

1. NWWDA TM-7 Cycle Slam Test: 1,000,000 cycles.
2. NWWDA TM-8 Hinge Loading Test: 1,000 lbs.
3. NWWDA TM-10 Edge Screw Holding: Test 700 lbs.
4. NWWDA TM-10 Face Screw Holding: Test 650 lbs.

C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to **NFPA 252**.

1. Test Pressure: Test at atmospheric pressure
2. Oversize, Fire-Rated Wood Doors: For door assemblies exceeding sizes of tested assemblies, provide manufacturer's standard Construction Label, acceptable to authorities having jurisdiction, stating that doors comply with requirements of design, materials, and construction.
3. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating of 250 deg F maximum after 30 minutes of fire exposure. Doors with this temperature-rise rating are limited to 100 sq. inches of clear view area of glazing.
4. Blocking: When through-bolts are not to be used, indicate size and location of blocking in 45, 60 and 90-minute mineral core doors.

D. Security Rating for Particle Core Doors:

1. ASTM F 476, Grade 40.

E. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors to prevent damage in transit. Place doors on cardboard or wooden skids and wrap entire bundles of doors in plastic sheeting.

C. Mark each door on top rail with opening number used on Shop Drawings.

SECTION 08 21 11

FLUSH WOOD DOORS

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity is between 25% and 55% during the remainder of the construction period.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section, or show telegraphing of core construction in face exceeding 0.01 inch in a 3-inch span.

a. Warranty shall be in effect for the life of the installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. LPDL Thermal Fused Flush Wood Doors:

a. The Maiman Company; Springfield, MO
b. Graham Doors; Mason City, IA

2. Metal Lite Kits for Doors:

a. Air Louvers, Inc.
b. Anemostat Door Products.
c. All Metal Stamping

2.2 DOOR CONSTRUCTION, GENERAL

A. Adhesives: Do not use adhesives containing urea formaldehyde.

B. LPDL Thermal Fused Wood Flush Doors:

1. WDMA I.S. 1A Performance Duty Level: Extra Heavy Duty

2. WDMA I.S. 1A Aesthetic Grade: Premium

3. LPDL Thermal-Fused Faces: Decorative faces thermally fused to cores under heat and pressure, complying with Laminating Materials Association's Product Standard and Typical Physical Properties of Decorative Overlays. LMA.2003.

4. Color or Woodgrain Pattern: To be selected from manufacturers full line of color options.

5. Edgebanding: Impact-resistant polymer edging, minimum .040" thick, applied to all four edges after faces on particle core doors, and on 2 vertical edges on mineral core doors. As selected by Architect from manufacturer's full range of products.

6. Provide doors with pilot holes factory-drilled for vertical edge hinges and lock sets.

2.3 SOLID-CORE DOORS

A. Particleboard Cores: Comply with the following requirements:

1. Particleboard: ANSI A208.1, Grade M-2.
2. Wood Stiles and Rails: Not required.
3. Blocking: Not required.

B. Mineral Core Fire-Rated Doors:

1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as needed to provide fire rating indicated.
2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated as needed to eliminate through-bolting hardware, as follows:

   a. 5-inch top-rail blocking for closer attachment.
   b. 5-inch bottom-rail blocking, in doors indicated to have protection plates or mortised automatic door bottoms.
   c. 5-inch midrail blocking, in doors indicated to have armor plates.
   d. 5-inch midrail blocking, in doors indicated to have exit devices.

3. Edge Construction: At hinge stiles, provide manufacturer's standard laminated-edge construction with improved screw-holding capability and split resistance and with outer stile matching polymer edging.

4. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile matching polymer edging, and laminated backing for improved screw-holding capability and split resistance.

5. Pairs: Provide meeting stiles with concealed intumescents, to eliminate the need for metal meeting edges and/or overlapping astragal.

2.4 LOUVERS AND LITE FRAMES

A. Wood Beads for Lite Openings in Particle Core Wood Doors:

1. Wood Species: Factory finished to match door face
2. Profile: Manufacturer’s standard lipped profile.
3. At 20-minute, fire-rated, wood-core doors, provide wood beads and intumescent glazing tape approved for such use.

B. Metal Frames for Lite Openings in Fire Doors: Manufacturer's standard frame formed of 0.0478-inch- thick, cold-rolled steel sheet; factory primed and approved for use in doors of fire rating indicated.

2.5 FABRICATION

A. Fabricate doors in sizes indicated for Project-site fitting.

B. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:

1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.

C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

D. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.

1. Light Openings: Trim openings with moldings of material and profile indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Division 8 Section "Door Hardware."

B. Manufacturer's Written Instructions: Install doors, lite kits, and glazing to comply with manufacturer's written instructions, referenced quality standard, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

END OF SECTION 08 21 11

SECTION 08 31 13

ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Access doors and frames.
   2. Fire-rated access doors and frames.

1.2 SUBMITTALS

A. Product Data: Manufacturer's literature for each type of access door indicated.

B. Coordination Drawings: Drawn to scale and coordinating access door and frame installation with ceiling support, ceiling-mounted items, and concealed Work above ceiling.

C. Samples: Submit manufacturer's standard size sample each exposed finish.

D. Schedule: Door and frame schedule, including types, general locations, sizes, construction details, latching or locking provisions, and other data pertinent to installation.

1.3 QUALITY ASSURANCE

A. Fire-Rated Access Doors and Frames: Units shall comply with NFPA 80 and labeled and listed by UL.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36.

B. Steel Sheet:
   1. Hot-Rolled: ASTM A 569, Commercial Steel (CS), Type B; free of scale, pitting, and surface defects; pickled and oiled.
   2. Cold-Rolled: ASTM A 366, Commercial Steel (CS), or ASTM A 620, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.
      a. Electrolytic zinc-coated steel sheet, complying with ASTM A 591, Class C coating, may be substituted at fabricator's option.

C. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304; with minimum sheet thickness indicated representing specified thickness according to ASTM A 480.

D. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum panels indicated.

E. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide sound foundation for field-applied topcoats despite prolonged exposure.

2.2 ACCESS DOORS AND FRAMES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Precision Ladders
   2. Bilco Company
   3. J. L. Industries, Inc.
   4. Karp Associates, Inc.
   5. Larsen's Manufacturing Company.
   6. Milcor Limited Partnership.
   7. Nystrom Building Products Co.

B. Flush Access Doors and Frames:
   1. Style: As approved by Architect.
   2. Material: Prime-painted steel sheet. Provide stainless steel at locations subject to moisture.
   3. Door: Minimum 14 gage thick sheet metal, set flush with exposed face flange of frame.
   4. Frame: Minimum 16 gage sheet metal.
   5. Hinges: Spring-loaded concealed pin type.
   6. Fire Ratings: As noted on drawings.
   7. Lock: Flush screwdriver-operated steel cam.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Advise installers of other work about specific requirements relating to access door and floor door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

C. Install access doors flush with adjacent finish surfaces or recessed to receive finish material.

D. Adjust doors and hardware after installation for proper operation.

END OF SECTION

SECTION 08 46 00

GLAZED INTERIOR WALL AND DOOR ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Framed glazed interior wall and door assemblies.

1.02 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.

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

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2013.

D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.

E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.

F. ASTM C1036 - Standard Specification for Flat Glass; 2011e1.

G. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

H. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009.

I. ASTM E413 - Classification for Rating Sound Insulation; 2010.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene at project site seven calendar days prior to scheduled beginning of construction activities of this section to review section requirements.

1. Require attendance by representatives of installer and other entities directly affecting, or affected by, construction activities of this section.
2. Notify Architect four calendar days in advance of scheduled meeting date.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's descriptive literature for each component in partition assembly.

C. Shop Drawings: Drawings showing layout, dimensions, identification of components, and interface with adjacent construction.

1. Include field measurements of openings.
2. Include Elevations Showing:
    a. Locations and identification of manufacturer-supplied door hardware and fittings.
    b. Locations and sizes of cut-outs and drilled holes for other door hardware.
3. Include Details Showing:

a. Requirements for support and bracing of overhead track.
b. Installation details.
c. Appearance of manufacturer-supplied door hardware and fittings.

D. Verification Samples: Two samples, minimum size of 2 inch by 3 inch, representing actual material and finish of exposed metal.

E. Design Data: Design calculations, bearing seal and signature of structural engineer licensed to practice in the State in which the Project is located, showing loads at points of attachment to the building structure.

F. Certificates: Contractor to certify that installer of partition assemblies meets specified qualifications.

G. Operation and Maintenance Data: For manufacturer-supplied operating hardware.

H. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

I. Specimen Warranty.

J. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Minimum three years of experience designing, assembling, and installing partition assemblies similar to those specified in this section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until installation.

1.08 WARRANTY

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

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

C. Provide five year manufacturer warranty against excessive degradation of metal finishes. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN - FRAMED GLAZED INTERIOR WALL AND DOOR ASSEMBLIES

A. Basis of Design: Raco Interiors. Solutions II 487 System.

B. Substitutions: See Section 01 6000 - Product Requirements.
1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.02 PERFORMANCE REQUIREMENTS

A. Acoustical Performance: Provide glass partitions and door assemblies tested by qualified testing agency, calculated in accordance with ASTM E413, tested in accordance with ASTM E90, and rated for not less than Sound Transmission Class (STC) indicated.
1. Partition STC Rating: 35, minimum, for framed partition.
2. Door STC Rating: 18, minimum, for sliding door.

SECTION 08 46 00

GLAZED INTERIOR WALL AND DOOR ASSEMBLIES

A. Framed Glazed Interior Wall Assembly: Factory fabricated assemblies consisting of center-glazed rectilinear aluminum framing with screw spline or clip joinery.

1. Configuration: As indicated on drawings.
2. Profile Width: 1-1/2 inch.
3. Profile Depth: 5-11/16 inch overall.
4. Profile Face Trim: 1-1/2 inch wide by 3/8 inch deep, snap in place.
5. Wall Construction Width, Throat Size: 5-1/4 inch nominal, consisting of 4 inch wide metal studs with 5/8 inch gypsum board on each side.
6. Surface mounted to face of wall as indicated on drawings.
7. Frame Finish: Class I natural anodized. **(VERIFY WITH ARCHITECT)**
8. Provide wood blocking at sill of glazing frame to match height of floor finish.
9. Exposed Fasteners: Stainless steel.
10. Perimeter Anchors: Steel, properly separated from aluminum framing.
11. Coordinate wall and door assembly preparation and provide hardware as necessary for fully operable installation.
12. Design system to withstand normal operation without damage, racking, sagging, or deflection.
13. Factory assembled to greatest extent practical; may be disassembled to accommodate shipping constraints.

D. Substitutions: See Section 01 6000 - Product Requirements.
   1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.04 FITTINGS AND HARDWARE

A. Glass Partition Door Hardware: Refer to the Section 08 7100.

2.05 MATERIALS

A. Glass: Flat glass meeting requirements of ASTM C1036, Type I - Transparent Flat Glass, Class 1 - Clear, Quality Q3, fully tempered in accordance with ASTM C1048, Kind FT, and as follows:
   1. Thickness: 1/2 inch.
   2. Color: Clear.
   3. Glazing Stops: Square edge, with rubber glazing gaskets.
   4. Glazing Gaskets: Provide flexible vinyl for non-fire rated and elastomeric silicone for fire rated frames.
   5. Prepare glazing panels for indicated fittings and hardware before tempering.
   6. Polish edges that will be exposed in finished work to bright flat polish.
   7. Temper glass materials horizontally; visible tong marks or tong mark distortions are not permitted.

B. Aluminum Components: Conforming to ASTM B221 (ASTM B221M), alloy 6063, T5 temper.

C. Stainless Steel Components: Conforming to ASTM A666, Type 316L alloy.

D. Sealant: One-part silicone sealant, conforming to ASTM C920, clear.

2.06 FINISHES

A. Class II Natural Anodized Finish: AAMA 611 AA-M12C22A31 Clear anodic coating not less than 0.4 mils thick.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated on shop drawings.

B. Verify that track supports are properly braced, level within 1/4 inch of required position and parallel to the floor surface.

C. Verify floor flatness of 1/8 inch in 10 feet, non-cumulative.

D. Do not begin installation until supports and adjacent substrates have been properly prepared.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean substrates thoroughly prior to installation.

B. Prepare substrates using the methods recommended by the manufacturer for achieving acceptable result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with glazed interior wall and door assembly manufacturer's instructions.

B. Fit and align glazed interior wall and door assembly level and plumb.

3.04 ADJUSTING

A. Adjust glazed interior wall and door assembly to operate smoothly from sliding or pivoting positions.

B. Adjust swing door hardware for smooth operation.

3.05 CLEANING

A. Clean installed work to pristine condition.

B. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Demonstrate operation of glazed interior wall and door assembly and identify potential operational problems.

3.07 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 08 51 13

ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Aluminum-framed windows of the following types:
   1. Fixed

1.2 DEFINITIONS

A. Performance grade number, included as part of the AAMA/NWWDA product designation code, is actual design pressure in pounds force per square foot used to determine structural test pressure and water test pressure.

B. Structural test pressure, for uniform load structural test, is equivalent to 150 percent of design pressure.

C. Minimum test size is smallest size permitted for performance class (gateway test size). Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum windows that meet or exceed the performance requirements indicated, based on testing manufacturer's windows that are representative of those specified and that are of test size indicated below:
   1. Minimum size required by AAMA/NWWDA 101/I.S.2.

B. Thermal Movements: Provide aluminum windows, including anchorage, that accommodate thermal movements of units resulting from the following maximum change (range) in ambient and surface temperatures without buckling, distortion, opening of joints, failure of joint sealants, damaging loads and stresses on glazing and connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces.

C. Sound Transmission Class (STC): Provide glazed windows rated for not less than 25 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, and fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum window indicated.

B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other Work, operational clearances, and the following:
   1. Joinery details.
   2. Expansion provisions.
   3. Flashing and drainage details.
   4. Glazing details.

C. Samples: Aluminum window components, sizes as follows:
   1. Main Framing Member: 12-inch- long, full-size sections of extrusions with factory-applied color finish.
   2. Hardware: Full-size units with factory-applied finish.
   3. Weather Stripping: 12-inch- long sections.

D. Qualification Data: For Installer.

E. Product Test Reports: Based on evaluation of comprehensive tests performed within the last four years by a qualified testing agency, for each type, grade, and size of aluminum window. Test results based on use of down-sized test units will not be accepted.

F. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

G. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

H. Fenestration Standard: Meet or exceed AAMA/NWWDA 101/I.S.2, "Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors," for minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

I. Glazing Publications: Comply with published recommendations of glass manufacturers and GANA's "Glazing Manual" unless more stringent requirements are indicated.

J. Preinstallation Conference: Conduct conference at Project site.

1.5 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
   1. Failure to meet performance requirements.
   2. Structural failures including excessive deflection.
   3. Water leakage, air infiltration, or condensation.
   4. Faulty operation of movable sash and hardware.
   5. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   6. Insulting glass failure.

B. Warranty Period:
   1. System Warranty: 5 years from date of Substantial Completion.
   2. Glass Warranty: 5 years from date of Substantial Completion.
   3. Metal Finishes: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Wausau Historical Series 8300i (basis of design)

2.2 MATERIALS

A. Aluminum: Comply with requirements of AAMA/WDMA/CSA 101/I.S.2/A440-05, 6063-T5 temper for strength, corrosion resistance and application of required finish.

B. Extruded frame members are to be .060” in thickness for structural walls.

2.3 GENERAL PERFORMANCE REQUIREMENTS:

A. Thermal Performance: Comply with NFRC 100.

B. Air Leakage, Water Resistance, Structural Test: Comply with ANSI/AAMA 101/I.S.2.

C. Forced-Entry Resistance: Comply with ASTM E 588.

D. Glass and Glazing Materials: Provide 5/8” glass with Insulating Low E Coating: U Factor =.53 / SHGC = 0.24.

2.3 FABRICATION

A. General: Fabricate aluminum windows, in sizes indicated, that comply with requirements and that meet or exceed AAMA/NWWDA 101/I.S.2 performance requirements for the following performance class. Include a complete system for assembling components and anchoring windows.
   1. Performance Grade: AAMA R30 (Residential Grade 30) minimum.
   2. Frame: 2-1/16” minimum with nail fin.
   3. Sash: Depth of 1 1/8”, hollow aluminum profile.
   4. Weather Stripping: Provide full-perimeter fin seal polypropylene pile weather stripping for each operable sash and ventilator.
   5. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.
   6. Hardware:
      a. Concealed block and tackle balancer.
      b. Single pull rail (sash lifts) on meeting rail sash.
      c. Automatic, spring loaded, height adjustable positive lock.

B. Fabricate frames and sash with mechanically joined corners. Corners are fastened with corrosion resistant screws and sealed with an acrylic sealant.

C. All fixed glass is exterior glazed and all sashes are marine glazed with flexible PVC glazing. The fixed glazing shall be removed without disassembly of a sash. The vents will need to be disassembled to replace the glazing.

2.4 INSECT SCREENS

A. Insect screens only apply to operable units if used in project.

1. Provide tight-fitting screen for operating sash with hardware to allow easy removal.

2. Screen Cloth: Charcoal colored fiberglass mesh.

3. Frame:Cambered formed aluminum with rigid plastic corner keys.

1. Pull tabs for removal.

2.5 FINISHES

A. Frame and Sash Color: Bronze Anodized Exterior Finish: Provide AA-C22-A32 Class II Bronze or AA-C22-A31 Class II Clear finish, minimum 0.4 mils thick, electrolytically deposited color anodized finish.

B. Color match screen frame to window frame and sash color.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances; rough opening dimensions; levelness of sill plate; coordination with wall flashings, and other built-in components; operational clearances; and other conditions affecting performance of work.
1. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches of opening.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components; Drawings; and Shop Drawings.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.

D. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

E. Metal Protection: Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified in "Dissimilar Materials" Paragraph in Appendix B in AAMA/NWWDA 101/I.S.2.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.

B. Testing Services: Testing and inspecting of installed windows shall take place as follows:
   1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502, Test Method A, by applying same test pressures required to determine compliance with AAMA/NWWDA 101/I.S.2 in Part 1 "Performance Requirements" Article.
   2. Testing Extent: Three windows as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested immediately after installation.
   3. Test Reports: Shall be prepared according to AAMA 502.

C. Remove and replace windows where test results indicate that they do not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.4 PROTECTION AND CLEANING

A. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

B. Clean aluminum surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 – GENERAL:

1.01 SUMMARY:

A. Section includes the supply and installation of the Finish Hardware.
   1. Include the termination of all Electrified Hardware.
   2. Include field verification of any existing doors, frames or hardware.

B. Related Sections
   1. Division 1
   2. Sealants – Division 7 / Division 7
   3. Openings – Division 8 / Division 8
   4. Finishes – Division 9 / Division 9
   5. Fire Alarm – Division 13/ Division 28
   6. Electrical – Division 16 / Division 26
   7. Security – Division 16 / Division 28

1.02 REFERENCES:

A. Documents and Institutes that shall be used in estimating, detailing and installing the items specified.
   1. International Building Code – Current/Adopted Edition
   2. ICC/ANSI A117.1 – Accessible and Usable Building and Facilities - Current/Adopted Edition
   3. NFPA 70 – Current/Adopted Edition
   4. NFPA80 –Standards For Fire Doors and Fire Windows – Current/Adopted Edition
   5. NFPA101 – Life Safety Code – Current/Adopted Edition
   6. NFPA105 – Installation of Smoke-Control Door Assemblies – Current/Adopted Edition.
   7. ANSI - American National Standards Institute
   8. BHMA – Builders Hardware Manufacturers Association
   9. UL – Underwriters Laboratory
   10. DHI – Door and Hardware Institute
   11. Texas Accessibility Standards – Current Adopted Edition
   12. Local Building Codes

1.03 SUBMITTALS

A. Comply with pertinent provisions of Division 01.

B. Finish Hardware Schedule to be in vertical format to include:
   1. Heading #/Hardware Set
   2. Door #, Location, Hand, Degree of Opening, Door Size and Type, Frame Size and Type, Fire Rating
   3. Quantity, type, style, function, product, product number, size, fasteners, finish and manufacturer of each hardware item.
   4. Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
   5. Keying schedule
   6. Title Sheet, Index, Abbreviations, Manufacturers List, Template List and Templates.

7. Mounting locations for hardware.
8. Explanation of abbreviations, symbols, and codes contained in schedule.
9. Date of the Finish Hardware Specification and Drawing / Door Schedule used in completing the Finish Hardware Schedule.
10. In Name, Company and Date of Field Verification if required.
11. Door Index; include door number, heading number, and hardware group.
12. Name and phone number for local manufacturer's representative for each product.
13. Submit in conjunction with Door and Frame Submittal.
14. Operation Description of openings with electrified hardware.

C. LEED Submittals:
1. Refer to Division 1 for any LEED submittal requirements.

D. Product Data: Provide product data in the form of a binder, manufacturer's technical product fact sheets for each item of hardware. Include whatever information may be necessary to show compliance with requirements, including instructions for installation and for maintenance of operating parts and finish.

E. Wiring Diagrams: Provide Riser/Elevation and Point to Point Wiring Diagrams for all openings with electrified hardware. Include all information that is necessary for coordination with other trades.

F. Samples: Provide samples as requested by Owner or Architect with Heading # and Door# marked on boxes. All samples will be returned to the contractor and used on doors for which they were marked.

G. Templates: Provide templates of finish hardware items to each fabricator of doors, frames and other work to be factory or shop prepared for the installation of hardware.

H. Keying Schedule: After meeting with the Owner, a keying schedule shall be submitted using keyset symbols referenced in DHI manual "Keying Systems and Nomenclature." The keying schedule shall be indexed by door number, keyset, hardware heading number, cross keying instructions and special key stamping instructions.

I. Operations and maintenance data: At the completion of the job, provide to the Owner one hard copies or one electronic copy of an Owner's operation and maintenance manual. The manual shall consist of a labeled hardcover three ring binder with the following technical information:
1. Title page containing: Project name, address and phone numbers. Supplier's name, address and phone numbers.
2. Table of Contents.
3. Copy of final (file and field use/as-installed) Finish Hardware Schedule.
4. Final Keying Schedule.
5. Maintenance instruction, adjustment, and preservation of finishes for each item of hardware.
6. Catalog pages for each items of hardware.
7. Installation Instructions for each item of hardware
8. Parts List for each item of hardware.
9. As installed point to point wiring diagrams for electrified hardware.
10. Warranties include Order #.

1.04 QUALITY ASSURANCES

A. Substitutions: Request for substitutions shall not be accepted within this project. Architect, Owner and Finish Hardware Consultant have selected one (1) specified and two (2) equals listed hereinafter in the Hardware Schedule. By this selection process they have established three (3) equal products for competitive pricing, while insuring no unnecessary delays by a substitution process. If any specified product is listed as a "No Substitution" product, this product will be supplied as specified, with no alteration or request of substitution. The reason for this is to comply with the uniformity established at this project. Parts and supplies are inventoried for these particular products for ease and standardization of replacement.

B. Supplier Qualifications: Supplier shall be recognized architectural finish hardware supplier, with warehousing facilities, who have been furnishing hardware in the project vicinity for a period of not less than 2 year and who is or employs a DHI Certified AHC, DHC, DHSC or person with a minimum of 10 years of experience as a hardware supplier. This person shall be available at reasonable times during the course of the work for consultation about products hardware requirements, to the Owner, Architect and General Contractor.

C. Installer Qualifications (Mechanical Hardware): All finish hardware shall be installed by the Finish Hardware Installer with a minimum of at least two (2) years documented experience. Installer shall attend a pre-installation meeting between the General Contractor, Finish Hardware Supplier/s, hardware manufacturer's representative for locks, closers and exit devices, and all door / frame suppliers. The Finish Hardware Installer shall be responsible for the proper installation and function of all doors and hardware.

D. Installer Qualifications (Electrified Hardware): All electrified finish hardware (power source, electrified locking or control device, switching device, through wire device and monitoring device) shall be installed by an Electronic Access Control Installer licensed by the Texas Department of Public Safety. The Electrified Finish Hardware Installer shall have a minimum of at least two (2) years of documented experience. Installer shall attend a pre-installation meeting between the General Contractor, Finish Hardware Supplier/s, Electrical Contractor, Fire Alarm Contractor, Security Contractor, hardware manufacturer's representative for electrified hardware, all door / frame suppliers. The Electrified Finish Hardware Installer shall be responsible for the proper installation, termination and function of all opening with electrified hardware. Installation shall include termination of all electrified products (including the required wire to the power supply and/or junction box).

1.05 DELIVERY, STORAGE AND HANDLING

A. Marking and packaging: Mark each item or package separately, with identification related to hardware set number, door number and keyset symbol.

B. Delivery:
   1. Deliver individually packaged and properly marked finish hardware at the proper time and location to avoid any delays in construction or installation.
   2. At time of delivery, inventory hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

C. Storage: Store hardware in enclosed, dry and locked area.

1.06 WARRANTY

A. All finish hardware products shall be covered by a 1 year factory warranty from the date of substantial completion of the project.

B. Supply warranty verification to the owner for all products that provide factory warranty. Warranty should include Factory Order # and date.

1.07 MAINTENANCE:

A. Maintenance Service
   1. None

B. Extra Materials:
   1. All extra screws, fasteners, and all special installation tools furnished with the hardware shall be turned over to the owner at the completion of the job.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Screws and Fasteners:
   1. All closers and exit devices provided for exterior doors, hollow metal doors, and all other required shall be provided with thru-bolts.
   2. All finish hardware shall be installed to manufacturer's recommendations, using screws, attachments and installation tools provided with the hardware. No other screws or attachments are acceptable.
   3. All other products to meet door and frame conditions.

B. Hinges:
   1. Template: Provide templated units only.
   2. Exterior: All exterior hinges shall be stainless steel base with stainless steel pin and stainless steel finish.
   3. Interior: All interior hinges steel based.
   4. Interior corrosive: All interior hinges at corrosive areas shall be stainless steel base with stainless still pin and stainless steel finish.
   5. All hinges on doors over 36" wide, with exit devices, or with push/pull shall be heavy weight.
   6. Electric Hinge: Provide minimum 8 wire.
   7. Provide non-removable pins for outswinging doors that are locked or are lockable.
   8. All hinges on doors with door closers shall be ball bearing.
   9. All hinges shall be full mortise.
   10. Size: Provide 4 ½ x 4 ½ hinges on doors up to 3'0" in width. Provide 5 x 4 ½ hinges over 3'0" to 4'0" in width. Reference manufacturers catalog for all other sizes.
   11. Number of Hinges: Provide number of hinges indicated but not less than 3 hinges for door leaf for doors 90" or less in height and one additional hinge for each 30" of additional height.
   12. Adjust hinge width as required for door, frame, trim and wall conditions to allow proper degree of opening.
   13. Provide hinges conforming to ANSI/BHMA A156.1.
   14. Provide spring hinges where specified. Provide two spring hinges and one bearing hinge per door leaf for doors 90 inches (2286 mm) or less in height. Provide one additional bearing hinge for each 30 inches (762 mm) of additional door height.
   15. Supply from the following list of manufacturers:
       Ives IVE

Hager HAG
Bommer BOM

C. Continuous Hinges
1. Continuous hinges to be manufactured of 6063-T6 aluminum.
2. Continuous hinge shall be certified to ANSI 156.26, Grade 1
3. Continuous hinge should be tested an approved UL10C.
4. Electrified – Provide minimum 8 wire with removable panel.
5. Provide hinges 1 inch shorter in length than nominal height of door, unless otherwise noted.
6. Provide reinforcing for doors weighing over 450 pounds and up to 600 pounds.
7. Supply from the following list of manufacturers:
   Ives IVE
   Select SEL
   Stanley STA

D. Mortise Locks
1. All locks on this project should be manufactured by the same manufacturer.
2. Mortise locksets shall meet ANSI/BHMA A156.13, Series 1000, Grade 1 Operational with all standard trims and conventional mortise cylinders.
3. All mortise locks shall be UL Listed for 3 hour fire door. Review lock for any height restriction.
4. Provide locks with a standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
5. Provide standard ASA strikes unless extended lip strike is necessary for frame/trim or 7/8” lip strike is necessary at pair with overlapping astragal.
6. Provide dust box.
7. Supply from the following list of manufacturers:
   Falcon FAL
   No Substitute

E. Exit Devices
1. All exit device types on this project should be manufactured by the same manufacturer.
2. Exit devices are to be architectural grade touch bar type. Touchpad to extend one half of door width.
3. Mechanism case to be smooth.
4. Exit devices shall meet ANSI A156.3, Grade 1.
5. All exit devices are UL listed Panic Exit or Fire Exit Hardware.
6. All lever trim to match lock trim in design and finish.
7. Dogging: Non-rated devices are to be provided with dogging. Less dogging where shown in Hardware Sets (some exterior, electrical rooms, electrified) Cylinder dogging as shown in hardware sets.
8. Exit devices are to be supplied and installed with thru-bolts for exterior, hollow metal doors, or as required for application.
9. Provide proper power supply for exit devices as required. Coordinate with Fire Alarm, Electrical and Security Contractor.
10. Push pads shall be metal, no plastic inserts allowed.
11. Exit devices shall have a flush end cap.
12. Exit devices shall be ordered with the correct strike for application.
13. Exit devices shall be order in the proper length to meet door width.
14. Exit devices shall have deadlatching.
15. Exit device shall be provided in width/height required based on door size.
16. Install exit devices with fasteners supplied by exit device manufacturer.

17. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits as required.
18. Provide proper concealed vertical rods for wood or hollow metal doors as required.
19. Factory or field drill weep holes for exit devices used in full exterior applications, highly corrosive areas, and where noted in the hardware sets.
20. Supply from the following list of manufacturers:
    Von Duprin VON 35/98 Series
    No Substitute

F. Pull Plates/Pulls/Push Plate
1. Pull and Push Plates to meet ANSI 156.6 for .050" thickness.
2. Pull and Push Plate size to 4" x 16".
3. Pull Plate to have 10" center and 1" round on pull plate with concealed fasteners.
4. Provide straight and offset pulls with fasteners as required
5. Provide concealed fasteners for all applications.
6. Prep plate for cylinder/lock as required.
7. Supply from the following list of manufacturers
    Ives IVE
    Trimco TRI
    Rockwood ROC

G. Door Closers
1. All door closers on this project should be manufactured by the same manufacturer.
2. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory.
3. Door closers shall be furnished with standard cover. Provide full cover as shown in hardware sets.
4. Size in accordance with the manufacturers recommendations for door size and condition.
5. Door closers shall be furnished with delayed action, hold-open as listed in the Hardware Sets.
6. Door closers shall be mounted out of the line of sight wherever possible (i.e., room side of corridor doors, etc.) with parallel arm mounting on out swinging doors.
7. All closer installation shall include thru bolts on exterior, hollow metal doors or where required for application.
8. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.
9. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
10. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
11. Supply from the following list of manufacturers
    Falcon FAL SC70
    No Substitute

H. Door Protection Plates
1. Protective plates shall meet ANSI A156.6 requirements for .050 thickness.

2. Protection plates should be fabricated from stainless steel or brass based on finish.
3. Protection plate shall be height as shown in Hardware Sets. Width shall be 10” by 2” less than door width on single door or pair with a mullion and 1” less than door width on pair of doors without a mullion.
4. Beveled 4 edges.
5. Provide kickplate on all doors with closers, unless not required for aesthetic reasons.
6. Prep protective plates for hardware as required.
7. Supply from the following list of manufacturers:

Ives	IVE
Rockwood	ROC
Trimco	TRI

I. Door Stops and Holders:
1. Supply wall stops at all openings to protect doors or door hardware. Install so lock does not lock unintentionally. Install blocking in wall where wall stop will be mounted.
2. When wall conditions do not permit use of wall stop provide floor stops with risers as needed to adjust for floor conditions.
3. When wall conditions do not permit use of wall stop provide overhead stops. Jamb mount where required to not be visible from Corridor.
4. Exterior Ground Level Doors: Provide security floor stop.
5. Exterior Roof Doors: Provide heavy duty overhead stop.
6. Supply from the following list of manufacturers:

Glynn Johnson	GLY
Rockwood	ROC
Trimco	TRI

J. Silencers
1. Provide silencers on all doors without seal. 3 for single doors and 2 for pairs.
2. Provide silencers as required for frame conditions. SR64 for hollow metal frames. SR65/SR66 for wood frames.
3. At wood frames, insure height of stop is compatible with silencer.
4. Supply from the following list of manufacturer’s

Ives	IVE
Rockwood	ROC
Trimco	TRI

K. Thresholds/Weatherstripping

1. Thresholds on doors in the accessible path shall conform to accessibility codes.
2. Threshold should be based on sill detail.
3. Smoke seal shall be teardrop design bulb seal.
4. Exterior seal/thresholds shall be silicone or brush as shown in hardware sets.
5. Drip strips shall protrude 2 ½” and be 4” wider than opening.
6. At S Label single doors provide seals on frame to comply with UL1784
7. At S Label pair of doors provide seals on frame and as meeting stile to comply with UL1784.
8. Automatic Door Bottom shall be mortised to comply with accessibility codes.
9. Supply from the following list of manufacturer’s

Zero	ZER
National Guard	NGP
Pemko	PEM

2.03 KEYING:

A. General: Finish Hardware Supplier shall meet in person with owner to finalize keying requirements prior to the locks and exit devices being ordered and match existing or start a new Master Key System for the project. During keying meeting all hardware functions should be reviewed with the owner to finalize lock and exit device functions. During keying meeting determine all expansion required.

B. Cylinders: Provide the correct and quantity of cylinders for all applications.

C. Keys: Provide nickel silver keys only. Furnish 2 change keys for each lock: 5 control keys: 5 master keys for each master system and 5 grandmaster keys for each grandmaster key system. Deliver all keys to Owners' Representative.

D. Cores and keys shall be provided with identification stamping.

E. Provide construction keying / construction cores for this project with constructions keys.

F. Provide Bitting List to Owner.

2.04 KEY CONTROL:

A. Key Management: Key control shall be provided, by supplying a complete key storage and management system. Each key shall be fully cut, indexed, tagged and installed on cabinet hooks by the lock supplier and shipped with the locks. Key cabinet provided shall be wall-mounted type with capacity plus 50%.

PART 3 – EXECUTION:

3.01 EXAMINATION:

A. Examine doors, frames and related items for conditions that would prevent the proper application of any finish hardware items. Do not proceed with installation until all defects are corrected.

B. Existing Door and Frame Compatibility: Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.

C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION:

A. Follow Door and Hardware Institute Publication:
Recommended Location for Architectural Hardware for Standard Steel Doors and Frames
Recommended Location for Builder's Hardware for Custom Steel Doors and Frames
Recommended Locations for Architectural Hardware for Wood Flush Door

B. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

C. Follow ANSI A117.1-1998 Accessible and Usable Building and Facilities and Texas Accessibility Standards.

D. Review mounting locations with Architect where required.

E. Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers should not be visible in corridors, lobbies and other public spaces where possible.

F. Locate power supplies in accessible location and indicate in as-builts where located.

G. Set threshold in full bed of sealant complying with requirements specfieid in Division 07.

H. Pre Installation meeting required with attendees to include Architect, General Contractor, Mechanical Hardware Installer, Electrified Hardware Installer, Finish Hardware Supplier and Manufacturer's Representative for Exit Device, Locks and Closers and Door/Frame Suppliers before installation begins.

3.03 FIELD QUALITY CONTROL:

A. After installation has been completed, obtain the services of an Architectural Hardware Consultant to check for proper installation of finish hardware, according to the finish hardware schedule and keying schedule. In addition, check all hardware for adjustments and proper operation.

3.04 ADJUST AND CLEAN:

A. Adjust, clean and inspect all hardware, to ensure proper operation and function of every opening. Replace items, which cannot be adjusted to operate freely and smoothly as intended for the application made.

3.05 PROTECTION:

A. The General Contractor shall use all means at his disposal to protect all finish hardware items from abuse, corrosion and other damage until the owner accepts the project as complete.

3.06 TRAINING

A. After installation has been completed, provide training to the Owner on the operation of the Finish Hardware and programming of any electrified hardware.

3.07 HARDWARE SCHEDULE

A. These hardware set shown below are for use as a guideline. Provide hardware as required to meet the requirements of the openings, security, and code requirements.

HARDWARE SET LAYOUT

0 – Existing, No Hardware Required or Cylinders
1 – Lockset - Office
2 – Lockset – Storeroom
3 – Latchset - Privacy
4 – Latchset - Passage
5 – Lockset - Classroom
6 – Hospital Latch

7 – Panic Hardware
8 – Push/Pull
9 – Sliding

R1 11/29/2022

Hardware Group No. 101CT

505.1
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	DORMITORY/EXIT LOCK	MA571L QG	626	FAL
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	SC71A SS	689	FAL
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE

Hardware Group No. 101NT

301.1
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	DORMITORY/EXIT LOCK	MA571L QG	626	FAL
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	SC71A RW/PA	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE

Hardware Group No. 101T

107.1
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	DORMITORY/EXIT LOCK	MA571L QG	626	FAL
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	SC71A RW/PA	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE

Hardware Group No. 103NT

108.1 604.1

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	DORMITORY/EXIT LOCK	MA571L QG	626	FAL
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE

Hardware Group No. 103ST

702.1 702.2

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	DORMITORY/EXIT LOCK	MA571L QG	626	FAL
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	OH STOP	90S	630	GLY

Hardware Group No. 103T

304.1 701.1 702.3

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	DORMITORY/EXIT LOCK	MA571L QG	626	FAL
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE

Hardware Group No. 203NST

104.1 110.1

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	MA581L QG	626	FAL
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	OH STOP	90S	630	GLY

Hardware Group No. 203T

412.1 810.1

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	MA581L QG	626	FAL
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE

Hardware Group No. 207T

109.1

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	MA581L QG	626	FAL
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	SC71A SS	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	PANIC HARDWARE	3547A-EO	626	VON
1	EA	PANIC HARDWARE	3547A-NL-OP-388	626	VON

Hardware Group No. 341T

803.1 804.1 805.1 806.1 807.1 809.1

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	MA311 OCCUPIED/VACANT QGM	626	FAL
1	EA	SURFACE CLOSER	SC71A RW/PA	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE

Hardware Group No. 401CT

102.2

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	PASSAGE SET	MA101 QG	626	FAL
1	EA	SURFACE CLOSER	SC71A SS	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE

Hardware Group No. 401NT

502.2

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	PASSAGE SET	MA101 QG	626	FAL
1	EA	SURFACE CLOSER	SC71A RW/PA	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE

Hardware Group No. 401T

201.1 202.1 509.1

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	MA101 QG	626	FAL
1	EA	SURFACE CLOSER	SC71A RW/PA	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE

Hardware Group No. 403T

108.2	302.1	303.1	305.1	306.1	
402.1	404.1	405.1	406.1	407.1	407.2
408.1	410.1	411.1	506.1	507.1	409.1
508.1	510.1	511.1	602.1		

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	MA101 QG	626	FAL
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE

Hardware Group No. 710AC

102.1

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY	628	IVE
1	EA	PANIC HARDWARE	3547A-EO	626	VON
1	EA	PANIC HARDWARE	3547A-NL-OP-388	626	VON
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
2	EA	90 DEG OFFSET PULL	8190EZHD 10" O	630	IVE
2	EA	SURFACE CLOSER	SC71A SS	689	FAL

Hardware Group No. 710AC1

101.2

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY	313AN	IVE
1	EA	PANIC HARDWARE	3547A-EO	643e	VON
1	EA	PANIC HARDWARE	3547A-NL-OP-388	643e	VON
1	EA	RIM CYLINDER	20-057 ICX	613	SCH
1	EA	FSIC CORE	23-030	613	SCH
2	EA	90 DEG OFFSET PULL	8190EZHD 10" O	643e	IVE
2	EA	SURFACE CLOSER	SC71A SS	695	FAL

Hardware Group No. 807T

801.1 802.1

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	613	IVE
1	EA	PUSH PLATE	8200 4" X 16"	613	IVE
1	EA	PULL PLATE	8303 10" 4" X 16" F	613	IVE
1	EA	SURFACE CLOSER	SC71A SS	695	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	613	IVE
1	EA	WALL STOP	WS406/407CCV	613	IVE

Hardware Group No. C201

604.2 604.3

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	EU STOREROOM LOCK	MA881-RXL QG	626	FAL
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	SC71A RW/PA	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE

Hardware Group No. C201T

504.1 502.1 602.2 603.2

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	EU STOREROOM LOCK	MA881-RXL QG	626	FAL
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
1	EA	FSIC CONST. CORE	23-030 ICX	622	SCH
1	EA	SURFACE CLOSER	SC71A RW/PA	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE

Hardware Group No. C701CT

401.2

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	613	IVE
1	EA	POWER TRANSFER	EPT10	695	VON
1	EA	ELEC PANIC HARDWARE	LD-RX-98-L-M996-17-FSE	643e	VON
1	EA	RIM CYLINDER	20-057 ICX	613	SCH
1	EA	FSIC CORE	23-030	613	SCH
1	EA	SURFACE CLOSER	SC71A SS	695	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	613	IVE

Hardware Group No. C701T

102.3

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	LD-RX-98-L-M996-17-FSE	626	VON
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	SC71A RW/PA	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE

Hardware Group No. C714A

401.1-EXT 101.1-EXT 601.1-EXT

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY EPT	695	IVE
2	EA	POWER TRANSFER	EPT10	695	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-3547A-EO	643e	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-3547A-NL-OP	643e	VON
1	EA	RIM CYLINDER	20-057 ICX	613	SCH
1	EA	FSIC CORE	23-030	613	SCH
2	EA	90 DEG OFFSET PULL	8190EZHD 10" O	643e	IVE
2	EA	SURFACE CLOSER	SC71A SS	695	FAL
2	EA	DOOR SWEEP	39D	D	ZER
1	EA	THRESHOLD	655D	D	ZER

Hardware Group No. C715A

501.1-EXT 604.4-EXT

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY EPT	695	IVE
1	EA	POWER TRANSFER	EPT10	695	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-35A-NL-OP	643e	VON
1	EA	RIM CYLINDER	20-057 ICX	613	SCH
1	EA	FSIC CORE	23-030	613	SCH
1	EA	SURFACE CLOSER	SC71A SS	695	FAL
1	EA	DOOR SWEEP	39D	D	ZER
1	EA	THRESHOLD	655D	D	ZER

Hardware Group No. C715T

901.1-EXT

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-98-NL	626	VON
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	SC71A SS	689	FAL
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	GASKETING	328AA H & J	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	655A	A	ZER

END OF SECTION

SECTION 08 80 00

GLASS AND GLAZING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Glass for hollow metal and wood doors which are not pre-glazed.
   2. Fire rated window frames.
   3. Mirrors.
   4. Associated glazing sealants and accessories.

1.2 SYSTEM REQUIREMENTS

A. Design Requirements: Provide continuity of building enclosure to maintain continuous air and vapor barrier throughout glazed assembly from glass pane to heel bead of sealant.

1.3 SUBMITTALS

A. General: Submit in accordance with Section 013300.
B. Product Data: Manufacturer's descriptive data and recommended installation instructions for each type of glass and glazing material specified, including glazing accessories and glazing sealants.
C. Shop Drawings: Sections and details of glass and glazing materials installation at framing members including head, mullions, transoms, jambs and sills.
D. Test Reports:
E. Warranty: Signed and dated by manufacturer.

1.4 QUALITY ASSURANCE

A. Single Source Responsibility: Glass of each type to be produced by same manufacturer.
B. Installer Qualifications: Minimum of 2 years successful experience on comparable projects and approved in writing by manufacturer.
C. Regulatory Requirements:
   1. Fabricate glass to comply with ASTM C1036, ASTM C1048, and ANSI Z97.1.
   2. Perform work in accordance with FGMA Glazing Manual for glazing installation methods.
D. Certifications:
   1. Manufacturer's letter certifying glass and glazing materials compatibility.
   2. Manufacturer's letter certifying that sealed insulating glass units meet or exceed specification.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products in accordance with Section 016000.

1.6 PROJECT CONDITIONS

A. Environmental Requirements:
   1. Perform glazing when ambient temperature is above 40°F.
   2. Perform glazing on dry surfaces only.

1.7 WARRANTY

A. Manufacturer's standard 10 year warranty on hermetically sealed insulating glass units and for mirrors.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. TGP Firerated Glass
B. Oldcastle Glass
C. Nippon Electric Glass
D. Guardian Industries
E. PPG Industries

2.1 GLASS MATERIALS

A. Clear Tempered:
   1. Quality: Glazing select, float, complying with ASTM C1036, Type I, Class 1, Quality q3.
   2. Type: Tempered, complying with ASTM C1048, Kind FT fully tempered.
   3. Thickness: 1/4 inch.

A. Wire-less Fire Rated Glass: Proprietary product in the form of two lites of clear ceramic glazing material laminated together to produce a laminated lite of 5/16-inch nominal thickness; polished on both surfaces; weighing 4 lb/sq. ft; and as follows:
   1. Fire-Protection Rating: As indicated for the assembly in which the glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
   2. Polished on both surfaces, transparent.
   3. Product: Subject to compliance with requirements, provide “Firelite Plus" and Pilkington Pyrostop 45” as designated on the drawings manufactured by TGP Firerated glass.

B. Unframed Mirrors
   1. ASTM C1036, mirror select quality, 1/4" clear plate. Backs shall have 2 coats of silver hermetically sealed, complying with GS-27, with an impervious protective coating of copper deposited over silver by electrolysis, and finished with a special composition hard, mirror-backing paint. Mirrors shall bear manufacturer's labels. Mirrors shall have ground and polished edges.
   2. Mirror Setting Mastic: As recommended by mirror manufacturer.

C. Insulated Glass Units (at field glazed windows and storefront):
   2. SIGMA No. 64-7-2 double pane with glass to elastomer edge seal
   3. Outer pane of 1/4" thick clear glass with low E coating on no. 2 surface; inner pane of 1/4" thick glass; interpane space purged dry hermetic air; total unit thickness of 1 inch
   4. Fully temper both lights (per ASTM C1048) in doors and elsewhere as required by referenced codes.
   5. Provide opaque glass where indicated on plans.

2.2 GLAZING ACCESSORIES

A. Setting Blocks:
   1. Material: Preformed neoprene, compatible with sealant.
   2. Hardness: 80-90 Shore A durometer.
   3. Size: 0.10 inch for each square foot of glazing, not less than 4 inch length x width of channel minus 1/16 inch x 1/4 inch high.

4. Location: Sill quarter points, centered minimum 4 inches from each edge.
5. Requirement: Resistant to sunlight, weathering oxidation and permanent deformation under load.

B. Spacer Shims:
1. Material: Preformed neoprene, compatible with sealant.
2. Hardness: 50-60 Shore A durometer.
3. Size: Minimum 3 inch length x 1/2 height of glazing stop x thickness to suit application.

C. Edge Blocks:
1. Material: Preformed neoprene, compatible with sealant.
2. Hardness: 60-70 Shore A durometer.
3. Size: Minimum 4 inch length x width to support thickness of glass, allow nominal 1/8 inch clearance between edge of glass and edge bumper.
4. Location: Place in vertical channel.
5. Requirement: Resistant to sunlight, weathering, oxidation and permanent deformation under load.

D. Glazing Tapes:
1. Material: Preformed butyl or closed cell PVC foam with integral spacing device and containing paper release.
2. Hardness: 10-15 Shore A durometer.
3. Size: Continuous corner to corner.
4. Acceptable products:
   a. Pre-Shimmed 440 Tape, Tremco, Cleveland, OH.
   b. 330 Glazing Tape, PTI, Dayton, OH.

2.3 GLAZING SEALANTS

A. Polyurethane (Type Sealant):
1. Single component, complying with FS TT-S-00230C, Type II, Class A, and ASTM C920, Type S, Grade NS, Class 25.
2. Moisture curing.
3. Hardness: 20-35 Shore A durometer.
4. Non-sagging, non-bleeding, non-staining.
5. Color as selected by the Architect.
6. Acceptable products:
   a. Permapol RC-1, PRC, Gloucester City, NJ.
   b. Sonolastic NP-1, Sonneborn Building Products, Minneapolis, MN.
   c. Dymonic, Tremco, Cleveland, OH.
   d. Dynatrol I, Pecora Corporation, Harleysville, PA.

PART 3 EXECUTION

3.1 EXAMINATION

B. Examine conditions and proceed with Work in accordance with Section 014000.
C. Verify that openings for glazing are correctly sized and within tolerances.
D. Verify that glazing channel surfaces or recesses are clear, free of burrs, obstructions, irregularities, and glass is free of edge damage or imperfections.

3.2 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.
B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
C. Prime surfaces scheduled to receive sealant, if required by sealant manufacturer.

D. Verify that materials used for cleaning edges of sealed insulating units are compatible with sealants and components and will not damage or cause deterioration of the integrity of the sealed insulating unit.

3.3 INSTALLATION

A. Install glass units in accordance with manufacturer's printed instructions. Ensure weep and drainage holes are not blocked by sealants or setting blocks.
B. Preformed Glazing Gaskets (Dry Method):
    1. Cut gasket to proper length.
    2. Weld joints by butting gasket and sealing junctions with sealant.
    3. Place setting blocks at quarter points, with edge blocks no more than 6 inches from corner.
    4. Rest glass on setting blocks and push against stop with sufficient pressure to ensure full contact and adhesion at perimeter.
    5. Install removable stops, avoiding displacement of gasket and exert pressure for full continuous contact.
C. Interior Dry Method (Tape and Tape):
    1. Cut glazing tape to length and install against permanent stop, projecting 1/16 inch above sight line.
    2. Place setting blocks at 1/4 points with edge blocks no more than 6 inches from corners.
    3. Rest glass on setting blocks and push against stop for full contact and adhesion at perimeter.
    4. Place glazing tape on free perimeter of glass in same manner described above.
    5. Install removable stop, avoid displacement of tape, exert pressure on tape for full continuous contact.
    6. Knife trim excess or protruding tape.
D. Tempered Glass:
    1. Do not cut, seam, nip or abrade tempered glass.
    2. Install in windows and sidelights where required by code.
E. GLASS MIRRORS
    1. Apply one additional coat of moisture-resistant paint, type recommended by manufacturer, to back of mirror.
    2. Allow to dry.
    3. Apply mirror mastic to cover not more than 25% of back mirror, 1/8" to 1/2" thickness of setting bed.
    4. Set mirror on concealed shelf angle.
    5. Press mirror against substrate to bond.
    6. Leave open ventilation space, 1/8" minimum between mirror and substrate.
    7. Do not seal off ventilation space at edge of mirror.

3.4 PROTECTION

A. Protect finished Work under provisions of Section 015000.
B. After installation, mark glass pane with an "X" by using removable plastic tape or paste.

3.5 CLEANING

A. Clean work under provision of Section 017800.
B. Remove excess glazing materials from finished surfaces.
C. Remove labels after work is completed.

D. Wash and polish both faces not more than 7 days prior to Owner's acceptance of work.
E. Comply with glass manufacturer's recommendations for final cleaning.

END OF SECTION

SECTION 09 29 00

GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Interior gypsum wallboard.
   2. Tile backing panels.
   3. Exterior gypsum sheathing.

1.2 SUBMITTALS

A. Product Data: For each type of gypsum product, joint, finish and accessories indicated.

B. Samples:
   1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.
   2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

B. Sound Transmission Characteristics: Provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

C. Comply with applicable specification recommendations of GA-216 and GA-600 as published by the Gypsum Association.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

C. Handle gypsum board to prevent damage to edges, ends, and surfaces. Do not bend or damage metal corner beads and trim.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 CEILING SUSPENSION SYSTEMS

A. Ceiling Support Materials and Systems: Comply with ASTM C 754 for conditions indicated.
   1. Resilient Furring Channels: 1/2-inch-deep members designed to reduce sound transmission.

2.2 GYPSUM WALLBOARD

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Gypsum Wallboard: ASTM C 36.
   1. Regular Type:
      a. Thickness: 5/8 inch or 1/2 inch, unless otherwise indicated.
      b. Long Edges: Tapered.
   2. Type X:
      a. Thickness: 5/8 inch.
      b. Long Edges: Tapered.
   3. Type C:
      a. Thickness: 5/8 inch.
      b. Long Edges: Tapered.
   4. Water-Resistant Gypsum Backing Board: ASTM C 630, 5/8 inch, Type X.
      a. Water resistant gypsum board is not acceptable as a tile backing substrate.
   5. Exterior Gold Bond gypsum sheathing
      a. Thickness: 5/8 inch.
      b. Long Edges: Tapered.
   6. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.
      a. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
      b. Long Edges: Tapered.
   7. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   8. Gypsum Board and Related Products:
      a. American Gypsum Co.
      b. G-P Gypsum Corp.
      c. National Gypsum Company.
      d. United States Gypsum Co.
      e. James Hardie Gypsum
      f. Pabco Gypsum
      g. Certainteed

C. Tile Backing Panels:
   1. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178, 5/8 inch, Type X.
      a. Product: Subject to compliance with requirements, provide "Dens-Shield Tile Backer" manufactured by G-P Gypsum Corp.

2.3 EXTERIOR GYPSUM BOARD FOR CEILINGS AND SOFFITS

A. Exterior Gypsum Soffit Board: A gypsum core soffit panel with additives to enhance the sag resistance of the core; surfaced with water repellant paper on front, back, and long edges; and complying with ASTM C 931 and C 1396 (Gold Bond Brand Exterior Soffit Board).
   a. Thickness: 5/8 in.
   b. Width: 4 ft
   c. Length: 8 ft. through 12 ft.
   d. Edges: Beveled Taper (Sta-Smooth Edge)

2.4 TRIM ACCESSORIES

A. Trim: ASTM C 1047.
   1. Material: Galvanized steel sheet
   2. Shapes:
      a. Cornerbead:
         1) Shape: L shape (typical), similar to Dur-a bead corner bead by USG
         2) Shape: rounded at corners of living areas
         3) Use at outside corners, unless otherwise indicated.
      b. LC-Bead: J-shaped; exposed long flange receives joint compound; use at exposed panel edges unless otherwise indicated.
      c. L-Bead: L-shaped; exposed long leg receives joint compound; use where indicated.
      d. U-Bead: J-shaped; exposed short flange does not receive joint compound; use where indicated.
      e. Expansion (Control) Joint: One piece formed with V shaped slot, with removable strip covering slot opening, use where indicated.

2.5 JOINT TREATMENT MATERIALS

A. Joint Materials: Comply with ASTM C 475
   1. Joint Tape:
      a. Interior Gypsum Wallboard: Paper.
      b. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.

B. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping or drying-type, all-purpose compound.
      a. Use setting-type compound for installing paper-faced metal trim accessories.
   3. Fill Coat: For second coat, use setting-type, sandable topping or drying-type, all-purpose compound.
   4. Finish Coat: Touch up as required.

C. Joint Compound for Tile Backing Panels:
   1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

2.6 TEXTURE FINISHES

A. Unit wall and ceiling finish: orange peel: submit sample of light and medium grade application for Owner approval.

B. Clubhouse finish: splatter drag: submit sample of light and medium grade application for Owner approval.

2.7 ACCESSORIES

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
   1. Wood Framing: ASTM C 1002, Type W for fastening to wood framing, unless otherwise indicated.
   2. Steel framing: Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

C. Isolation Strip at Exterior Walls:
   1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
   2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

D. Sound Attenuation Blankets: As specified in Section 09 81 00 – Acoustical Insulation.

E. Thermal Insulation: As specified in Section 07 21 00 – Thermal Insulation.

F. Acoustical Sealant: As specified in Section 07 92 00 – Joint Sealants.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 LIGHTGUAGE COMPONENTS

A. Direct Furring and Channels:
   1. Screw to wood framing.
   2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

3.3 APPLYING AND FINISHING PANELS - GENERAL

A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.

B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

C. Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Attach gypsum panels to framing provided at openings and cutouts.

F. Form control and expansion joints with space between edges of adjoining gypsum panels.

G. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.

H. Fit gypsum panels around ducts, pipes, and conduits.

I. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

J. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

K. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.
   1. Space screws a maximum of 12 inches o.c. for vertical applications.

L. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.

M. Attachment to Wood Framing:
   1. Install gypsum panels over wood framing, with floating internal corner construction.

N. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

3.4 PANEL APPLICATION METHODS

A. Single-Layer Application:
   1. Ceilings:
      a. Install across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panel’s not less than one framing member.
      b. Apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
   2. Partitions/Walls: Apply gypsum panels vertically (parallel to framing), to minimize end joints.
      a. Stagger abutting end joints not less than one framing member in alternate courses of board.

b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

3. Z-furring members: Apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

B. Multi-Layer Applications:
1. Ceilings: Apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. Partitions and Walls: Apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. Fastening Methods: Fasten base layers and face layers separately to supports with screws or fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.

C. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

D. Glass-Mat, Water-Resistant Backing Panel: Comply with manufacturer's written installation instructions and install at wet locations indicated to receive tile. Install with 1/4-inch gap where panels abut other construction or penetrations.
1. Space fasteners 6 inches o.c. Drive fasteners flush with coated surface. Do not countersink.

3.5 INSTALLATION - TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints at locations indicated on Drawings, as recommended by board manufacturer’s recommendations and in accordance with ASTM C840.

C. Interior Trim: Install in the following locations:
1. Cornerbead: Use at outside corners, unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated.
4. U-Bead: Use at exposed panel edges.
5. Curved-Edge Cornerbead: Use at curved openings.

3.6 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Provide finish of gypsum board surfaces in accordance with the Gypsum Association "Recommended Specification: Levels of Gypsum Board Finish" as follows:
   1. Level 0 Temporary Construction: No taping, finishing, or accessories required.
   2. Level 1 Fire Taping at plenum areas above ceiling, in attics, in areas where the assembly will be concealed or in building service corridors and other areas not normally open to public view.
      a. Joints and interior angles shall have tape embedded in joint compound.
      b. Surface shall be free of excess joint compound.
      c. Tool marks and ridges are acceptable.
   3. Level 2 Water resistant gypsum board for storage areas, or other similar area where surface appearance is not of primary concern. (Storage, riser rooms)
      a. Joints and interior angles shall have tape embedded in joint compound and wiped with a joint knife leaving a thin coating joint compound over joints and interior angles.
      b. Fastener heads and accessories shall be covered with a coat of joint compound.
      c. Surface shall be free of excess joint compound.
      d. Tool marks and ridges are acceptable.
      e. Joint compound applied over the body of the tape at the time of tape embedment shall be considered a separate coat of joint compound and shall satisfy the conditions of this level.
   4. Level 3 Appearance areas to receive heavy or medium texture (spray or hand applied) finishes before final painting, or where heavy grade wallcoverings are to be applied as final decoration. This level of finish is not to be used where smooth painted surface or light to medium wallcoverings are to be applied. (Unit walls and ceilings)

3.7 APPLYING TEXTURE FINISHES

A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.

B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture matching approved mockup, free of starved spots or other evidence of thin application or of application patterns.

C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture finish manufacturer's written recommendations.

3.8 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 09 22 20

PORTLAND CEMENT PLASTER

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Metal lath and accessories.
   2. Portland cement plaster.
   3. Stucco finishes.

1.2 QUALITY ASSURANCE

A. Mockups: Before plastering, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Install mockups for each type of finish indicated.
   2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver cementitious materials to Project site in original packages, containers, or bundles, labeled with manufacturer's name, product brand name, and lot number.

B. Store materials inside, under cover, and dry, protected from weather, direct sunlight, surface contamination, aging, corrosion, and damage from construction traffic and other causes.

1.4 PROJECT CONDITIONS

A. Environmental Requirements, General: Comply with requirements of referenced plaster application standards and recommendations of plaster manufacturer for environmental conditions before, during, and after plaster application.

B. Cold-Weather Requirements: Provide heat and protection, temporary or permanent, as required to protect each coat of plaster from freezing for at least 48 hours after application. Distribute heat uniformly to prevent concentration of heat on plaster near heat sources; provide deflection or protective screens.

C. Warm-Weather Requirements: Protect plaster against uneven and excessive evaporation and from strong flows of dry air, both natural and artificial. Apply and cure plaster as required by climatic and job conditions to prevent dry out during cure period. Provide suitable coverings, moist curing, barriers to deflect sunlight and wind, or combinations of these, as required.

D. Protect contiguous work from soiling and moisture deterioration caused by plastering. Provide temporary covering and other provisions necessary to minimize harmful spattering of plaster on other work.

E. Exterior Plasterwork:
   1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
   2. Apply plaster when ambient temperature is greater than 40 deg F.
   3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.

F. Factory-Prepared Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Expanded-Metal Lath:
      a. Alabama Metal Industries Corp. (AMICO).
      b. California Expanded Metal Products Co.
      c. Dale/Incor Industries, Inc.
      d. Dietrich Industries, Inc.
      e. National Gypsum Co.
      f. Unimast, Inc.
      g. United States Gypsum Co.
      h. Western Metal Lath Co.

2.2 LATH

A. Expanded-Metal Lath: Comply with ASTM C 847 for material, type, configuration, and other characteristics indicated below.
   1. Material: Fabricate expanded-metal lath from sheet metal conforming to the following:
      a. Galvanized Steel: Structural-quality, zinc-coated (galvanized) steel sheet complying with ASTM A 653, G60 minimum coating designation, unless otherwise indicated.
   2. Diamond-Mesh Lath: Comply with the following requirements:
      a. Configuration: Self-furring.
      b. Weight: 3.4 lb/sq. yd.

2.3 ACCESSORIES

A. General: Comply with ASTM C 1063 and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

B. Zinc and Zinc-Coated (Galvanized) Accessories:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Alabama Metal Industries Corporation (AMICO).
      b. California Expanded Metal Products Company (CEMCO).
      c. Dale/Incor.
      d. Dietrich Industries, Inc.
      e. Phillips Manufacturing Co.
      f. Unimast, Inc.
      g. Western Metal Lath & Steel Framing Systems.

C. Foundation Weep Screed: Fabricated from hot-dip galvanized steel sheet, ASTM A 653/A 653M, G60 zinc coating.

D. Cornerite: Fabricated from metal lath with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.

E. External-Corner Reinforcement: Fabricated from metal lath with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.

F. Cornerbeads: Fabricated from zinc-coated (galvanized) steel.
   1. Small nose cornerbead with perforated flanges; use unless otherwise indicated.

G. Casing Beads: Fabricated from zinc-coated (galvanized) steel, with perforated flanges in depth required to suit plaster bases indicated and flange length required to suit applications indicated. Provide square-edge style; use unless otherwise indicated.

H. Control Joints: Fabricated from zinc-coated (galvanized) steel. One-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.

I. Expansion Joints: Fabricated from zinc-coated (galvanized) steel. Two-piece type, formed to produce slip-joint and square-edged 2-inch wide reveal; with perforated concealed flanges.

J. Lath Attachment Devices: Material and type required by ASTM C 1063 for installations indicated.

K. Molded, Rigid Cellular Polystyrene Board Insulation for Premanufactured Trim Units: Comply with ASTM C 578 for Type I, and EIMA's "EIMA Guideline Specification for Expanded Polystyrene (EPS) Insulation Board" for more stringent requirements for material performance and qualities of insulation, including dimensions and permissible variations, and the following:

L. Aging: Before cutting and shipping, age insulation in block form by air drying for not less than six weeks or by another method approved by EIMA that produces equivalent results.

M. Flame-Spread and Smoke-Developed Indexes: 25 and 450 or less, respectively, per ASTM E 84.

N. Profile: As indicated on Drawings.

O. Reinforcing Mesh for application over polystyrene board insulation at premanufactured trim units: Balanced, alkali-resistant, open-weave glass-fiber mesh treated for compatibility with finish coat materials, made from continuous multiend strands with retained mesh tensile strength of not less than 120 lbf/in. per EIMA 105.01, complying with ASTM D 578 and the following requirements for minimum weight:

P. High-Impact Reinforcing Mesh: Not less than 15 oz./sq. yd.

2.4 PLASTER MATERIALS

A. Base-Coat Cements: Portland cement, ASTM C 150, Type I.

B. Acrylic-Based Finish Coatings: Factory-mixed acrylic-emulsion coating systems, formulated with colorfast mineral pigments and fine aggregates; for use over portland cement plaster base coats. Include manufacturer's recommended primers and sealing topcoats for acrylic-based finishes.
   1. Products: Subject to compliance with requirements, provide finish coat material by one of the following manufacturers:
      a. Bonsal, W. R. Co.;
      b. ChemRex, SonoWall Stucco Systems;
      c. Dryvit Systems, Inc.;
      d. Parex Incorporated;

e. Pleko Products, Inc.;
f. Senergy, Inc.;
g. Sto Corp.;
h. Stuc-O-Flex International, Inc.;

2. Provide color selected by Architect from manufacturer's full range of colors.

C. Lime: Special hydrated lime for finishing purposes, ASTM C 206, Type S; or special hydrated lime for masonry purposes, ASTM C 207, Type S.

D. Sand Aggregate for Base Coats: ASTM C 897.

2.5 MISCELLANEOUS MATERIALS

A. Water for Mixing and Finishing Plaster: Potable.

B. Bonding Agent: ASTM C 932.

C. Steel drill screws complying with ASTM C 1002 for fastening metal lath to wood or steel members less than 0.033 inch thick.

D. Steel drill screws complying with ASTM C 954 for fastening metal lath to steel members 0.033 to 0.112 inch thick.

2.6 PLASTER MIXES AND COMPOSITIONS

A. General: Comply with ASTM C 926 for base- and finish-coat mixes as applicable to plaster bases, materials, and other requirements indicated.

B. Base-Coat Mixes and Compositions: Proportion materials for respective base coats in parts by volume per sum of cementitious materials for aggregates to comply with the following requirements for each method of application and plaster base indicated. Adjust mix proportions below within limits specified to attain workability.

C. Three-Coat Work over Metal Lath: Base-coat proportions as indicated below:
1. Scratch Coat: 1 part portland cement, 0 to 3/4 parts lime, 2-1/2 to 4 parts aggregate.
2. Brown Coat: 1 part portland cement, 0 to 3/4 parts lime, 3 to 5 parts aggregate.

D. Stucco Finish Coat: Add water only; comply with stucco manufacturer's written instructions.

2.7 MIXING

A. Mechanically mix cementitious and aggregate materials for plasters to comply with applicable referenced application standard and with recommendations of plaster manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION OF LATH AND FURRING, GENERAL

A. Standards: Comply with ML/SFA 920, "Guide Specifications for Metal Lathing and Furring," and with requirements of ASTM C 1063.

B. Install supplementary framing, blocking, and bracing at terminations in work and for support of fixtures, equipment services, heavy trim, grab bars, handrails, furnishings, and similar work to

comply with details indicated or, if not otherwise indicated, to comply with applicable written instructions of lath and furring manufacturer.

C. Isolation: Where lathing and metal support system abuts building structure horizontally and where partition or wall abuts overhead structure, sufficiently isolate from structural movement to prevent transfer of loading from building structure. Install slip- or cushion-type joints to absorb deflections but maintain lateral support.
   1. Frame both sides of control joints independently and do not bridge joints with furring and lathing or accessories.

D. Install additional framing, furring, runners, lath, and beads, as required to form openings and frames for other work as indicated. Coordinate support system for proper support of framed work that is not indicated to be supported independently of metal furring and lathing system.

3.2 LATHING

A. Install metal lath for the following applications where plaster base coats are required. Provide appropriate type, configuration, and weight of metal lath selected from materials indicated that comply with referenced ML/SFA specifications and ASTM lathing installation standards.

3.3 PREPARATIONS FOR PLASTERING

A. Clean plaster bases and substrates for direct application of plaster, removing loose material and substances that may impair the Work.

B. Install temporary grounds and screeds to ensure accurate rodding of plaster to true surfaces; coordinate with scratch-coat work.

C. Refer to Division 6 Sections for installing permanent wood grounds, if any.

3.4 INSTALLATION OF PLASTERING ACCESSORIES

A. General: Comply with referenced lathing and furring installation standards for provision and location of plaster accessories of type indicated. Miter or cope accessories at corners; install with tight joints and in alignment. Attach accessories securely to plaster bases to hold accessories in place and in alignment during plastering. Install accessories of type indicated at following locations:
   1. External Corners: Install corner reinforcement at external corners.
   2. Terminations of Plaster: Install casing beads, unless otherwise indicated.
   3. Control Joints: Install at locations indicated or, if not indicated, at locations complying with the following criteria and approved by Architect:
      a. Where an expansion or contraction joint occurs in surface of construction directly behind plaster membrane.
      b. Distance between Control Joints: Not to exceed 18 feet in either direction or a length-to-width ratio of 2-1/2 to 1.
      c. Wall Areas: Not more than 144 sq. ft.
      d. Horizontal Surfaces: Not more than 100 sq. ft. in area.
      e. Where plaster panel sizes or dimensions change, extend joints full width or height of plaster membrane.

3.5 PLASTER APPLICATION

A. Plaster Application Standard: Apply plaster materials, composition, and mixes to comply with ASTM C 926.

B. Do not use materials that are frozen, caked, lumpy, dirty, or contaminated by foreign materials.

C. Do not use excessive water in mixing and applying plaster materials.

D. Flat Surface Tolerances: Do not deviate more than plus or minus 1/8 inch in 10 feet from a true plane in finished plaster surfaces, as measured by a 10-foot straightedge placed at any location on surface.

E. Sequence plaster application with installation and protection of other work so that neither will be damaged by installation of other.

F. Plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground, unless otherwise indicated. Where interior plaster is not terminated at metal frame by casing beads, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.

G. Corners: Make internal corners and angles square; finish external corners flush with cornerbeads on interior work, square and true with plaster faces on exterior work.

H. Number of Coats: Apply plaster of composition indicated, to comply with the following requirements:
   1. Three Coats: Over over metal lath.

I. Finish Coats: Apply finish coats to comply with the following requirements:
   1. Prepared Finish: Apply stucco finish coats, acrylic-based finish coats, and other factory-prepared finish coats according to manufacturer's written instructions.

J. Moist-cure plaster base and finish coats to comply with ASTM C 926, including written instructions for time between coats and curing in "Annex A2 Design Considerations."

3.6 CUTTING AND PATCHING

A. Cut, patch, replace, repair, and point up plaster as necessary to accommodate other work. Repair cracks and indented surfaces. Point-up finish plaster surfaces around items that are built into or penetrate plaster surfaces. Repair or replace work to eliminate blisters, buckles, check cracking, dry outs, efflorescence, excessive pinholes, and similar defects. Repair or replace work as necessary to comply with required visual effects.

3.7 CLEANING AND PROTECTING

A. Remove temporary covering and other provisions made to minimize spattering of plaster on other work. Promptly remove plaster from door frames, windows, and other surfaces not to be plastered. Repair surfaces stained, marred or otherwise damaged during plastering work. When plastering work is completed, remove unused materials, containers, equipment, and plaster debris.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure plaster work is without damage or deterioration at the time of Substantial Completion.

SECTION 09 22 20

PORTLAND CEMENT PLASTER

END OF SECTION 09220

SECTION 09 30 00

TILING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes dimension stone tile and related setting materials applied to **f**loors and walls.

1.2 SUBMITTALS

A. Product Data: For setting and grouting materials.

B. Shop Drawings: Include plans, elevations, and details showing stone tile sizes, dimensions of tiled areas, joint patterns, and tile patterns.

C. Samples: For each stone tile and for each color and finish required; include full-size units.

1.3 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain each variety of stone, regardless of tile size and finish, from the same location in a single quarry.

B. Mockups: Install mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.

1. Install mockups on site for owner approval
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Full-size units equal to 3 percent of amount installed for each stone, variety, and size indicated.

PART 2 - PRODUCTS

2.1 DIMENSION FLOOR TILE – RE; FINISH PLANS FOR TILE SELECTIONS

A. Floor Tile, General:

1. Abrasion Resistance: Minimum value of 10 as determined per ASTM C 1353 or ASTM C 241.
2. Static Coefficient of Friction: Determined by testing identical products per ASTM C 1028.

a. Level Surfaces: Minimum 0.6.

b. Ramp Surfaces: Minimum 0.8.

B. Porcelain Tile:

1. Porcelain Tile Mfg. – RE: Finish Plans.

C. Edges: Eased

D. Module Size: Match owner provided sample in pattern TBD

E. Nominal Tile Thickness: 1/4 inch.

F. Joint Width: 1/8 inch.

2.2 SETTING AND GROUTING MATERIALS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Olean Tile Company.
2. Atlas Minerals & Chemicals, Inc.
3. Boiardi Products Corporation.
4. Bonsal, W. R. Co.
5. Bostik.
6. C-Cure Corporation.
7. Custom Building Products.
8. Dal-Tile Corporation.
9. DAP, Inc.
10. Laticrete International, Inc.
11. Mapei Corporation.
12. Southern Grouts & Mortars, Inc.
13. Summitville Tiles, Inc.
14. TEC Incorporated.

C. Setting Materials:

1. Thin-Set Mortar: ANSI A118.1, nonsagging dry-set portland cement.

D. Grout Materials:

1. Grout for Joints 1/8 inch and Narrower: ANSI A118.6 dry set.
2. Grout for Joints Wider than 1/8 inch: ANSI A118.6 commercial portland cement.
3. Colors: As selected from manufacturer's full range.

2.3 ACCESSORIES

A. Cementitious Backer Units: ANSI A118.9.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

2. Products: Subject to compliance with requirements, provide one of the following:

    a. Custom Building Products; Wonderboard.
    b. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
    c. United States Gypsum Co.; DUROCK Cement Board.

B. Sealer for Floors: Colorless, slip- and stain-resistant sealer, not affecting color or physical properties of stone surfaces as recommended by stone tile manufacturer for application indicated.

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

    a. American Olean Tile Company.
    b. Bostik.
    c. Custom Building Products.
    d. Hillyard Floor Treatments.
    e. HMK Stone Care Products.
    f. Summitville Tiles, Inc.

C. Crack Suppression: provide at all tile flooring and 6” up walls at restrooms.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. MAPEI - MAPELASTIC CI CRACK ISOLATION MEMBRANE

2.4 STONE TILE FABRICATION

A. General: Fabricate tiles that are free of cracks, seams, starts, and other defects impairing their function for use indicated.

B. Facial Dimensions: Vary from specified dimensions by not more than plus or minus 1/64 inch for tiles with polished or honed faces; or plus or minus 1/32 inch for tiles with sand-rubbed, natural-cleft, or thermal-finished faces.

C. Thickness of Stone Tiles with Smooth Finish: Vary from specified thickness by not more than plus or minus 1/32 inch.

D. Thickness of Stone Tiles with Natural-Cleft or Thermal Finish: Vary average thickness of each tile from specified thickness by not more than plus or minus 1/16 inch .

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Installation Methods: Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA designations indicated.

B. Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" applicable to installation methods and setting and grouting materials indicated.

C. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile. Where cut edges will be visible after installation, finish to match factory-fabricated edges.

E. Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are the same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting.

F. Match tiles within each space by selecting tiles to achieve uniformity of color and pattern. Reject or relocate tiles that do not match color and pattern of adjacent tiles.

G. Mix tiles to achieve a uniformly random distribution of color shadings and patterns.

H. Orient tiles with grain direction as indicated or, if not indicated, as directed.

I. Expansion- and Control-Joint Installation Method: Comply with TCA EJ171. Joint-sealant materials and installation are specified in Division 7 Section "Joint Sealants."

J. Butter backs of tiles with setting material before setting, and place tiles before back buttering and setting bed have skinned over.

3.2 STONE FLOOR TILE INSTALLATION

A. Concrete Slab Substrates: For floor tile installed with dry-set or latex-portland cement mortars, provide concrete substrates that comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards for installations indicated.

1. Use trowelable leveling and patching compounds per tile-setting material manufacturer's written instructions to fill cracks, holes, and depressions.
2. Remove protrusions, bumps, and ridges by sanding or grinding.

B. Thin-Set Installation, Bonded to Subfloor: TCA F113 thin-set mortar bonded to concrete subfloor.

3.3 STONE WALL TILE INSTALLATION

A. Thin-Set Installation: TCA W243 thin-set mortar bonded to gypsum board.

3.4 INSTALLATION TOLERANCES

A. Variation from Plumb: For vertical joints, external corners, and other conspicuous lines, maximum 1/8 inch in 8 feet.

B. Variation in Level: For horizontal joints and other conspicuous lines, do not exceed 1/4 inch in 20 feet , or 1/2 inch maximum.

C. Variation in Surface Plane of Flooring: Do not exceed 1/8 inch in 10 feet from level or slope indicated when tested with a 10-foot straightedge.

D. Variation in Plane between Adjacent Units (Lipping): Do not exceed the following differences between faces of adjacent units as measured from a straightedge parallel to the tiled surface:

1. Units with Polished or Honed Faces: 1/64 inch.
2. Units with Sand-Rubbed Faces: 1/32 inch.
3. Units with Thermal-Finished or Natural-Cleft Faces: Depth of finish or 3/16 inch, whichever is less.

E. Variation in Joint Width: Do not vary joint thickness more than 1/16 inch or one-fourth of nominal joint width, whichever is less.

3.5 CLEANING AND PROTECTING

A. Remove and replace material that is stained or otherwise damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Clean stone tiles after setting and grouting is complete; use procedures recommended by stone producer and grout manufacturer for types of application indicated.

C. Apply sealer to cleaned stone tile flooring, according to sealer manufacturer's written instructions.

END OF SECTION 09 30 00

SECTION 09 51 10

ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes acoustical tiles for ceilings and the following:
   1. Concealed suspension systems.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete at ceilings.

1.3 DEFINITIONS

A. CAC: Ceiling Attenuation Class.

B. LR: Light Reflectance coefficient.

C. NRC: Noise Reduction Coefficient.

1.4 QUALITY ASSURANCE

A. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.

B. Source Limitations:
   1. Acoustical Ceiling Tile: Obtain each type through one source from a single manufacturer.
   2. Suspension System: Obtain each type through one source from a single manufacturer.

C. Source Limitations: Obtain each type of acoustical ceiling tile and supporting suspension system through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical tiles, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical tiles, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical tiles carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

A. Coordinate layout and installation of acoustical tiles and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
1. Products: Subject to compliance with requirements, provide one of the products specified.
2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 ACOUSTICAL TILES, GENERAL

A. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.

B. Acoustical Tile Colors and Patterns: Match appearance characteristics indicated for each product type.
1. Where appearance characteristics of acoustical tiles are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 MINERAL-BASE ACOUSTICAL TILES FOR ACOUSTICAL TILE CEILING (ATC).

A. Products:
   1. Armstrong “Dune,” fine texture.

B. Classification: Provide tiles complying with ASTM E 1264 for Type III, mineral base with painted finish.
   1. Pattern: Fine Texture.
   2. Wet rated Pattern: Fine Texture, with washable vinyl-film overlay. Refer to finish schedules for wet rated tile locations

C. Color: White.

D. LR: Not less than .83.

E. NRC: Not less than .50.

F. CAC: Not less than 30.

G. Edge Detail: Beveled Tegular.

H. Thickness: 5/8”.

I. Size: 24 by 24 inches.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
   1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
   1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
   2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.

2.5 METAL SUSPENSION SYSTEM FOR ACOUSTICAL TILE CEILING

A. Products:
   1. Suspension System: DUNE INTERLUDE 9/16” t-grid system

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical tile ceilings.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION, SUSPENDED ACOUSTICAL TILE CEILINGS

A. General: Install acoustical tile ceilings to comply with ASTM C 636 and seismic requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
   4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   5. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.

C. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical units.
   1. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
   2. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Install suspension system runners so they are square and securely interlocked with one

another. Remove and replace dented, bent, or kinked members.

E. Arrange directionally patterned acoustical tiles as follows:
   1. As indicated on reflected ceiling plans.
   2. Install tiles in a basket-weave pattern.

3.4 CLEANING

A. Clean exposed surfaces of acoustical tile ceilings, including trim and edge moldings. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.
   1. Luxury Vinyl Composition tile (LVT).
   2. Vinyl Composition tile (VCT).

B. Resilient base.

C. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

C. Section 09 0561 - Common Work Results for Flooring Preparation: Independent agency testing of concrete slabs, removal of existing floor coverings, cleaning, and preparation.

1.03 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

B. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004 (Reapproved 2014)e1.

C. ASTM F1861 - Standard Specification for Resilient Wall Base; 2008 (Reapproved 2012)e1.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Verification Samples: Submit two samples, 12 by 12 inch in size illustrating color and pattern for each resilient flooring product specified.

D. Concrete Testing Standard: Submit a copy of ASTM F710.

E. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of sub-floor is acceptable.

F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Stair Materials: Quantity equivalent to 5 percent of each type and color.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

D. Protect roll materials from damage by storing on end.

E. Do not double stack pallets.

1.06 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 TILE FLOORING

A. Vinyl Composition Tile: Homogeneous, with color extending throughout thickness.
   1. Manufacturers:
      a. Armstrong World Industries, Inc: www.armstrong.com.
      b. Johnsonite, a Tarkett Company: www.johnsonite.com.
      c. Mannington Mills, Inc: www.mannington.com.
      d. Azrock. www.azrock.com. **Basis of Design.**
      e. Substitutions: See Section 01 6000 - Product Requirements.
   2. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
   3. Size: 12 by 12 inch.
   4. Thickness: 0.125 inch.
   5. Pattern: as selected by Architect.

B. Luxury Vinyl Composition Tile
   1. Luxury Vinyl Composition Tile (LVT): ASTM F 1066-95.
      a. Per owner selected sample.
   2. Clas: 1 (solid-color tile).
   3. Wearing Surface: Smooth.
   4. Thickness: 1/8 inch.
   5. Size: Verify with Architect.
   6. SS-T 312B (1), Type IV.

2.02 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove.
   1. Height: 4 inch.
   2. Thickness: 0.125 inch thick.
   3. Finish: Satin.
   4. Length: Roll.
   5. Color: as indicated in the drawings.
   6. Accessories: Premolded external corners and end stops.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

1. VOC Content Limits: As specified in Section 01 6116.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.

1. Test in accordance with Section 09 0561.
2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

C. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prepare floor substrates for installation of flooring in accordance with Section 09 0561.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Fit joints and butt seams tightly.

E. Set flooring in place, press with heavy roller to attain full adhesion.

F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern.

3.05 RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.06 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.07 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

3.08 SCHEDULE - AS INDICATED IN THE DRAWINGS.

END OF SECTION

SECTION 09 65 30

RESILIENT WALL BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Wall base.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.4 PROJECT CONDITIONS

A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F , in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After post-installation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 COLORS AND PATTERNS

A. Colors and Patterns: To be selected by Architect from manufacturer’s full range of colors.

2.2 RESILIENT WALL BASE, See Room Finish Schedule for locations.

A. Wall Base: ASTM F 1861.

B. Type (Material Requirement): TS rubber, vulcanized thermoset..

C. Group (Manufacturing Method): I (solid, homogeneous).

D. Style: Cove (with top-set toe).

E. Minimum Thickness: 0.125 inch..

F. Height: 4 inches.

G. Lengths: Cut lengths 48 inches long or coils in manufacturer's standard length.

H. Outside Corners: pre-molded.

I. Inside Corners: pre-molded**.**

J. Surface: Shadow base ribs..

2.3 INSTALLATION MATERIALS

A. Trowel-able Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturers for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.

B. Concrete Substrates for Stair Accessories: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
3. Moisture Testing:

a. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

D. Use trowel-able leveling and patching compound to fill cracks, holes, and depressions in substrates.

E. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

1. Do not install resilient products until they are the same temperature as the space where they are to be installed.

F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 RESILIENT WALL BASE INSTALLATION

A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

D. Do not stretch wall base during installation.

E. Pre-molded Corners: Install pre-molded corners before installing straight pieces.

F. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
2. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.

3. Damp-mop surfaces to remove marks and soil.

    a. Do not wash surfaces until after time period recommended by manufacturer.

B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

END OF SECTION 09 65 30

SECTION 09 68 13

TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, loose laid with edges and control grid adhered.

1.02 RELATED REQUIREMENTS

A. Section 09 0561 - Common Work Results for Flooring Preparation: Independent agency testing of concrete slabs, removal of existing floor coverings, cleaning, and preparation.

1.03 PRICE AND PAYMENT PROCEDURES

A. Section 01 2100 - Allowances: n/a

1.04 REFERENCE STANDARDS

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Shop Drawings: Indicate layout of joints, direction of carpet pile, and location of edge moldings.

D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.06 WARRANTY

A. Wear: Lifetime Limited Wear Warranty.

B. Backing: Lifetime Limited Wear Warranty.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.08 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

SECTION 09 68 13

TILE CARPETING

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Tile Carpeting:
   1. Tandus: www.tandus.com.
   2. Interface, Inc: www.interfaceinc.com.
   3. Lees Carpets: www.leescarpets.com.
   4. Milliken & Company: www.milliken.com.
   5. Shaw.
   6. Patcraft.
   7. Mannington. **Basis of Design.**
   8. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACCESSORIES

A. Sub-Floor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Rubber, color as selected by Architect.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.

C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for flooring installation by testing for moisture and pH.
   1. Test in accordance with Section 09 0561.
   2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Prepare floor substrates for installation of flooring in accordance with Section 09 0561.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.

F. Adhere carpet tile to substrate along centerline of rooms, at perimeter of rooms, where tiles are cut, and at 15 foot intervals throughout rooms. Lay remainder of tile dry over substrate.

G. Trim carpet tile neatly at walls and around interruptions.

H. Complete installation of edge strips, concealing exposed edges.

3.04 INSTALLATION ON STAIRS

A. Use one piece of carpet for each tread and the riser below. Apply seam adhesive to all cut edges.

B. Lay carpet with pile direction in the length of the stair.

C. Adhere carpet tight to stair treads and risers.

3.05 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 91 00

PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Surface preparation and field painting of exposed exterior and interior items and surfaces.

1.2 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 and ASTM D523 apply to this Section.
   1. Flat: Lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
   2. Low Sheen/Low Luster: Low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
   3. Semigloss: Medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
   4. Full gloss: High-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's data for each paint system indicated, including block fillers and primers. Data shall include label analysis and instructions for handling, storing, and applying each coating material.

B. Material List: Submit an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.

C. Samples:
   1. Architect or Interior Designer will furnish Contractor a color schedule, color chips or selected colors prior to commencing work.
   2. Submit samples a minimum of 30 days prior to commencing painting work.
   3. Label and identify each sample as to location and application.
   4. Resubmit as requested by Architect until required sheen, color, and texture are achieved.
   5. Samples shall define each separate coat, including primer and block filler.
   6. Submit two 8 inch x 10 inch samples of each color and material specified, including the correct sheen and texture. Samples shall be on heavy cardboard except as follows:
      a. Concrete Unit Masonry: Two 4-by-8-inch samples of each type of masonry indicated for use on project, with mortar joint in the center.
      b. Stained or Natural Wood: Two 4-by-8-inch samples of the same species and quality indicated for use on project.
      c. Metallic Finishes: Two 3-by-6-inch aluminum ques with specified coating system applied in a stepped application, allowing all coats to be visible.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. ASTM Standards listed in paint manufacturer's technical literature.
   2. UL Ratings listed in paint manufacturer's technical literature.
   3. Federal Specifications listed in paint manufacturer's technical literature.

4. Local and Federal regulations regarding toxicity and air quality regulations.

B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

C. Applicator Qualifications: A firm or individual with a minimum 5 years experience in applying paints and coatings similar in material, design, and scope to this project.
1. A job mock-up shall be provided by the Contractor's Applicator doing the work. Location and dimensions to be determined by Owner/Owner's Representative. The product Manufacturer/Representative must be present to provide assistance and training in the proper application methods and procedures during mock-up activity. Upon approval by Owner/Owner's Representative this mock-up becomes the "Job Standard". A "Certificate of Training" shall be signed by Applicator and Manufacturer/Manufacturer's Representative and kept on file with Owner/Owner's Representative.
2. The Contractor is ultimately responsible for the workmanship and quality of the applied material. Inspections by the Owner, Engineer or others does not limit the Contractor's responsibility.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.
1. Protect materials from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.
2. Store materials in manner and quantities that are in strict accordance with local ordinances, state laws, or fire underwriter regulations.

1.6 PROJECT CONDITIONS

A. Environmental Requirements:
1. Apply paints when ambient and surface temperature conforms to manufacturer's recommendations. Do not apply paint in the following conditions:
   a. Snow, rain, fog, or mist
   b. When relative humidity exceeds 85 percent
   c. At temperatures less than 5 deg F above the dew point
   d. To damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to location as instructed by Owner.
1. Quantity: Furnish Owner with an additional 3 percent, but not less than 1 gal., of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products from one of the following manufacturers:
   1. Sherwin-Williams Co.
   2. ICI Paint Centers
   3. Kwal Paint
   4. Benjamin Moore
   5. Kelly Moore
   6. Pratt & Lambert

2.2 PAINT MATERIALS

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another, and with the substrates indicated, under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint materials, factory formulated and recommended by manufacturer for application indicated.

C. Colors:
   1. Schedule of colors may be based on various manufacturers' color palettes.
   2. Manufacturer supplying paint shall match colors.
   3. Obtain clarification of intended color at locations where color is not indicated on schedule or drawings.

D. Schedule of Finishes: Refer to the "Finish Schedule" on the Drawing for designated finishes of areas.

E. Paint Products: As indicated in Schedule of Paint Products at end of section.

2.3 ACCESSORIES

A. Application Materials:
   1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
   2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
   3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application. Comply with procedures specified in PDCA P4.
   1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
   2. Commencement of painting will be construed as Applicator's acceptance of surfaces and conditions.

B. Test shop applied primer to verify compatibility with cover materials.

C. Verify moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture contents are at range acceptable to paint manufacturer.

3.2 PREPARATION

A. General:
1. Prior to commencing painting work, remove and protect hardware, accessories, electrical plates, lighting fixtures and similar items.
2. Mask permanent labels.
3. Surfaces requiring painting or finishing shall be thoroughly dry and cured, free of dirt, dust, rust, stains, scale, mildew, wax, grease, oil, deteriorated substrates, bond-breakers, efflorescence and other foreign matter detrimental to the coating's adhesion and performance.
4. Repair voids, cracks, nicks, and other surface defects, with appropriate patching material. Finish flush with surrounding surfaces and match adjacent finish texture.
5. Determine moisture content of plaster, stucco, cementitious materials, wood, and other moisture-holding materials by use of a reliable electronic moisture meter.

B. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
1. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted.
   a. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze.
   b. Use mechanical methods of surface preparation to remove film from hardeners or sealers that may interfere with paint adhesion.
   c. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
   d. Determine alkalinity and moisture content of surfaces by performing appropriate tests. Do not paint surfaces if moisture content or alkalinity exceeds that permitted in manufacturer's written instructions.
   e. Clean concrete floors indicated to receive paint with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow drying, and vacuuming before painting.
2. Wood:
   a. Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces to smooth and dust off.
   b. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer prior to applying primer.
   c. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler tinted to match wood color. Sand smooth when dried.
   d. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
   e. Backpriming:
      1) Locations scheduled to receive transparent or stain finish: Backprime with VOC compliant varnish.
      2) Backprime exterior woodwork, which is to receive paint finish, with exterior primer paint.
      3) Backprime interior woodwork, which is to receive paint or enamel finish, with enamel undercoater paint.
      4) Back-prime wood trim before installation.
   f. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.

3. Ferrous Metals:
    a. Bare Steel:
        1) Clean ungalvanized ferrous-metal surfaces that have not been shop primed; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
        2) Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6**.**
    b. Shop Primed Metals:
        1) Verify compatibility of primer and finish coats. Provide barrier coats over incompatible primers or remove and reprime.
        2) Wire-brush and clean with solvents approved by paint manufacturer
        3) Touch-up bare areas and damaged or chipped shop-applied prime coats with the same primer used for shop-applied coat.
        4) Remove severely damaged or incompatible prime coats and re-prime, and touch up with same primer as the shop coat.
4. Galvanized Surfaces: In accordance with ASTM D6386 “Surface Preparation for Galvanized Metal”.

C. Material Preparation: Mix and prepare paint materials according to manufacturer’s written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

D. Tinting: Manufacturer shall shop tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions.
1. Paint colors, surface treatments, and finishes as indicated in the paint schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. Sand lightly between each succeeding enamel or varnish coat.
5. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
6. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
7. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practical after preparation and before subsequent surface deterioration.
1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.

2. Priming will not be required on items delivered with prime or shop coats, unless otherwise specified. Touch up prime coats applied by others as required to ensure an even primed surface before applying finish coat
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

D. Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

E. Exposed Surfaces: Paint exposed surfaces, except where indicated that the surface or material is not to be painted or is to remain natural. If a finish is not indicated, verify with Architect prior to painting that surface. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
1. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
2. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.

F. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

G. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

H. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.

I. Block Fillers: Provide level of block fill as scheduled to conform with the following:
1. Level 1 – Regular Fill: Minimum block fill, reduces irregularity in masonry profile. One coat, spray applied.

J. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

K. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

L. Touch Up for Previously Coated Surfaces:
   1. Touch up marred, scraped, and blemished areas of surfaces which were factory primed or previously coated.
   2. Properly prepare and touch up scratched, abrasions, and blemishes and remove foreign matter before proceeding with succeeding coats.
   3. Feather touch up coating overlapping minimum 2 inches onto adjacent unblemished areas producing smooth, uniform surface.
   4. Touch up fasteners, welded surfaces and surrounding, field connections and areas on which shop coat has been abraded or damaged with specified primer before corrosion or other damage occurs from exposure.

M. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

A. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied:
   1. Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.
   2. Testing agency will perform a generic ID test to verify type of product and manufacturer.
   3. Testing agency will perform appropriate tests for the following characteristics as required by Owner:
      a. Quantitative material analysis
      b. Abrasion resistance
      c. Apparent reflectivity
      d. Flexibility
      e. Washability
      f. Absorption
      g. Accelerated weathering
      h. Dry opacity
      i. Accelerated yellowness
      j. Recoating
      k. Skinning
      l. Color retention
      m. Alkali and mildew resistance
   4. Owner may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

3.5 CLEANING

A. Cleanup:
   1. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site. Take precautions to prevent fires.
   2. During the course of the Work, remove misplaced paint and stain spots or spills. Leave Work in clean condition acceptable to Architect.
   3. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.6 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
   1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 SCHEDULE OF PAINT PRODUCTS

A. The following schedule of paint products is intended to identify manufacturer's highest quality recommended systems. Recommended systems for substrates or applications that are not identified in the schedule shall be submitted by paint manufacturer for approval.

3.8 EXTERIOR PAINT PRODUCTS

A. Colors to be verified with final color board.

B. Exterior Ferrous Metals: Provide the following finish systems over exterior ferrous metal.
   1. System Description: 2-coats finish over 1-coat primer. Primer is not required on shop-primed items or if not required by finish coat manufacturer.
   2. Primer – First Coat (provide red or white color as appropriate for finish coat color)

		Waterborne (100% Acrylic)	Solventborne
a.	Sherwin Williams	B66WI	B50Z Series

   3. Flat – Second and Third Coat

a.	Sherwin Williams	A-100 Latex Flat A6 Series	---

   4. Low-Luster - Second and Third Coat

a.	Sherwin Williams	A-100, A82 Series	---

   5. Semi-gloss – Second and Third Coat

a.	Sherwin Williams	A-100 Latex Gloss A8 Series	B55Z600

   6. Gloss - Second and Third Coat

a.	Sherwin Williams	B66W100 DTM Acrylic Coating	B54Z

C. Exterior Galvanized Metals: Provide the following finish systems over exterior galvanized metal surfaces:
   1. System Description: 2-coats finish over 1-coat primer. Primer is not required on shop-primed items or if not required by finish coat manufacturer.
   2. Pretreatment: As recommended by paint manufacturer
   3. Primer – First Coat

		Waterborne (100% Acrylic)	Solventborne
a.	Sherwin Williams	B71Y1	B50WZ30

   4. Flat – Second and Third Coat

a.	Sherwin Williams	A-100 Latex Flat A6 Series	---

   5. Low-Luster - Second and Third Coat

a.	Sherwin Williams	A-100, A82 Series	---

   6. Semi-gloss – Second and Third Coat

a.	Sherwin Williams	A-100 Latex Gloss A8 Series	B55Z600

   7. Gloss - Second and Third Coat

a.	Sherwin Williams	B66W100 DTM Acrylic Coating	B54Z

D. Exterior Aluminum: Provide the following finish systems over exterior aluminum surfaces:
   1. System Description: 2-coats finish over 1-coat primer. Primer is not required on shop-primed items or if not required by finish coat manufacturer.

2. Primer – First Coat

	Waterborne (100% Acrylic)	Solventborne
a. Sherwin Williams	B71Y1	B50WZ30

3. Flat – Second and Third Coat

a. Sherwin Williams	A-100 Latex Flat A6 Series	---

4. Low-Luster - Second and Third Coat

a. Sherwin Williams	A-100, A82 Series	---

5. Semi-gloss – Second and Third Coat

a. Sherwin Williams	A-100 Latex Gloss A8 Series	B55Z600

6. Gloss - Second and Third Coat

a. Sherwin Williams	B66W100 DTM Acrylic Coating	B54Z

E. Wood: Apply to exterior wood fascias, soffits, trim, wood posts, columns, beams and exposed trim and framing indicated to be painted.

1. System: 2-coats finish over 1-coat primer
2. Primer – First Coat

	Waterborne (100% Acrylic)	Solventborne
a. Sherwin Williams	B42W41	Y24W20

3. Flat – Second and Third Coat

a. Sherwin Williams	A-100 Latex Flat A6 Series	---

4. Low-Luster - Second and Third Coat

a. Sherwin Williams	A-100, A82 Series	---

5. Semi-gloss – Second and Third Coat

a. Sherwin Williams	A-100 Latex Gloss A8 Series	B55Z600

6. Gloss - Second and Third Coat

a. Sherwin Williams	B66W100 DTM Acrylic Coating	B54Z

3.9 INTERIOR PAINT PRODUCTS

A. Interior Ferrous Metals: Provide the following finish systems over interior ferrous metal.

1. System Description: 2-coats finish over 1-coat primer. Primer is not required on shop-primed items or if not required by finish coat manufacturer.
2. Primer – First Coat (provide red or white color as appropriate for finish coat color)

	Waterborne (100% Acrylic)	Solventborne
a. Sherwin Williams	B66-WI	B50Z Series

3. Flat – Second and Third Coat

	Waterborne (Vinyl Acrylic)	Solventborne
a. Sherwin Williams	ProMar 200, B30W200 Series	B32WZ1101

4. Low-Luster - Second and Third Coat (eggshell)

	Waterborne (Acrylic)	Solventborne
a. Sherwin Williams	B20W200	B33WZ1101

5. Semi-gloss – Second and Third Coat

	Waterborne (Acrylic)	Solventborne
a. Sherwin Williams	B30W200	B55Z600

6. Gloss - Second and Third Coat

	Waterborne (100% Acrylic Non blocking)	Solventborne
a. Sherwin Williams	B21 Series	B54Z

B. Interior Galvanized Metals: Provide the following finish systems over interior galvanized metal surfaces:

1. System Description: 2-coats finish over 1-coat primer. Primer is not required on shop-primed items or if not required by finish coat manufacturer.
2. Pretreatment: As recommended by paint manufacturer
3. Primer – First Coat

	Waterborne (100% Acrylic)	Solventborne
a. Sherwin Williams	B66-310	B50WZ30

4. Low-Luster - Second and Third Coat (eggshell)

	Waterborne (100% Acrylic)	Solventborne
a. Sherwin Williams	B20W200	B33WZ1101

5. Semi-gloss – Second and Third Coat

a. Sherwin Williams	B31W200	B55Z600

6. Gloss - Second and Third Coat

	Waterborne (100% Acrylic Non blocking)	Solventborne
a. Sherwin Williams	B21 Series	B54Z

C. Interior Aluminum: Provide the following finish systems over interior aluminum surfaces:

1. System Description: 2-coats finish over 1-coat primer. Primer is not required on shop-primed items or if not required by finish coat manufacturer.
2. Pretreatment: As recommended by paint manufacturer
3. Primer – First Coat

	Waterborne (100% Acrylic)	Solventborne
a. Sherwin Williams	B66-310	B50WZ30

4. Low-Luster - Second and Third Coat (eggshell)

	Waterborne (100% Acrylic)	Solventborne
a. Sherwin Williams	B20W200	B33WZ1101

5. Semi-gloss – Second and Third Coat

	Waterborne (100% Acrylic)	Solventborne
a. Sherwin Williams	B31W200	B55Z600

6. Gloss - Second and Third Coat

	Waterborne (100% Acrylic Non blocking)	Solventborne
a. Sherwin Williams	B21 Series	B54Z

D. Interior Gypsum Board, Plaster and Concrete - Non-Wet Areas: Apply to gypsum board, plaster and concrete except for wet areas.

One coat to cover.

E. Interior Wood Finishes - Enamel: Apply exposed wood indicated to receive opaque paint finish.

1. Primer – Factory Primed.
2. Low-Luster - Second and Third Coat (eggshell):

	Waterborne (100% Acrylic)	Solventborne
a. Sherwin Williams	B31 Series	

3. Semi-gloss – Second and Third Coat

	Waterborne (100% Acrylic)
a. Sherwin Williams	B31WJ2

4. Gloss - Second and Third Coat

	Waterborne (100% Acrylic Non blocking)
a. Sherwin Williams	B21 Series

END OF SECTION

SECTION 10 21 13

TOILET COMPARTMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. High Pressure Laminate (HPL) with Particle Board Substrate (Bobrick DesignerSeries).
   1. Toilet partitions.
   2. Urinal privacy screens.

1.2 RELATED SECTIONS

A. Section 05 50 00 - Metal Fabrications.

B. Section 06 10 00 - Rough Carpentry.

C. Section 09 51 23 - Acoustical Tile Ceilings.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Submit manufacturer's shop drawings for each product specified, including the following:
   1. Plans, elevations, details of construction and attachment to adjacent construction.
   2. Show anchorage locations and accessory items.
   3. Verify dimensions with field measurements prior to final production of toilet compartments.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square representing actual product, color, and patterns.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 10 year experience manufacturing similar products.

B. Installer Qualifications: Minimum 2 year experience installing similar products.

C. Single Source Requirements: To the greatest extent possible provide products from a single manufacturer.

D. Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to ADA and ICC/ANSI A117.1 requirements as applicable.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

B. Handling: Handle materials to avoid damage.

1.6 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.7 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.8 WARRANTY

A. Manufacturer's Warranty (SierraSeries and DuraLineSeries): Manufacturer's standard 25 year limited warranty for panels, doors, and stiles against breakage, corrosion, delamination, and defects in factory workmanship. Manufacturer's standard 1 year guarantee against defects in material and workmanship for stainless steel door hardware and mounting brackets.

B. Manufacturer's Warranty (DesignerSeries and MetroSeries): Manufacturer's standard 2 year warranty for materials and workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Products: Based on the quality and performance requirements of the project, specifications are based solely on the products of Bobrick Washroom Equipment, Inc. www.bobrick.com. Location of manufacturing shall be the United States.

B. Substitutions: The Architect will consider products of comparable manufacturers as a substitution, pending the Contractor's submission of adequate documentation of the substitution in accordance with procedures in Division 1 of the Project Manual. Documentation shall include a list of five similar projects of equivalent size where products have been installed for a minimum of two years, and manufacturer's certification that products are fabricated in the United States.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 HIGH PRESSURE LAMINATE WITH PARTICLE BOARD SUBSTRATE (Bobrick DesignerSeries)

A. High Pressure Laminate Toilet Partitions:
   1. Design Type:
      a. Standard Height.
         1) Door/Panel Height: 58 inches (147 cm).
         2) Floor Clearance: 12 inches (30 cm).
      b. Maximum Height.
         1) Door/Panel Height: 71-3/4 inches (182 cm).
         2) Floor Clearance: 4-1/2 inches (11 cm).

2. Mounting Configuration:
    a. Floor-mounted, overhead-braced with extruded anodized aluminum headrails, 0.065 inch (1.65 mm) thick with anti-grip profile.
        1) Stile Height: 83 inches (211 cm).

B. High Pressure Laminate Urinal Screens:
1. Mounting Configuration:
    a. Floor-anchored standard height.
        1) Screen Standard Height: 58 inches (178 cm) with floor clearance: 12 inches (30 cm)
        2) Stile Standard Height: 69 inches (175 cm)
    b. Wall-hung.
        1) Screen Height: 48 inches (122 cm) with 12 inches (30 cm) floor clearance.

C. Finished Thickness: 1 inch (25 mm) for stiles, doors, screens and panels.

D. Materials: 3-ply, stiles, panels, doors, and screens.
1. Cores: 45 lb (20.4 kg) density, industrial grade, resin-impregnated, particle board.
2. Surfaces: High-pressure laminated plastic NEMA LDS-1985 minimum thickness 0.050 inch (1.33 mm) with matte finish.
3. Fabrication: Bonded high-pressure plastic laminate to core material with adhesive specially formulated to prevent delamination. Edges bonded prior to bonding face sheets. Splices or joints in faces or edges are not acceptable except in the case of laminate material limitations.
4. Color:
    a. As indicated in drawings finish schedule.

E. Fire Resistance:
1. National Fire Protection Association/International Building Code Interior Wall and Ceiling Finish: Class B / Uniform Building Code: Class II.
    a. Flame Spread Index (ASTM E 84): 60 for panels and stiles.
    b. Smoke Developed Index (ASTM E 84): 265 for panels and stiles.

F. Stiles: Floor-anchored stiles furnished with expansion shields and threaded rods.
1. Leveling Devices: 3/8 inch x 7/8 inch (10 mm x 22 mm) steel bar welded to 11 gauge (3 mm) steel-reinforcing core; chromate-treated and double zinc-plated; welded to sheet-steel core of stiles.
2. Stile Shoes: One-piece, 22 gauge (0.8 mm), 18-8, Type 304 stainless steel, 4 inch (102 mm) height; tops with 90 degree return to stile. One-piece shoe capable of adapting to 3/4 inch (19 mm) or 1 inch (25 mm) stile thickness and capable of being fastened (by clip) to stiles starting at wall line.

G. Wall Posts: Pre-drilled for door hardware, 18-8, Type 304, 16 gauge (1.6 mm) stainless steel with satin finish; 1 inch (25 mm) x 1-1/2 inches (38 mm) x 58 inches high (1473 mm).

H. Anchors: Expansion shields and threaded rods at floor connections as applicable. Threaded rods secured to supports above ceiling as applicable. Supports above ceiling furnished and installed as Work of Section 05 50 00 - Metal Fabrications.

I. Hardware:
1. Compliance: Operating force of less than 5 lbs. (2.25 kg).
2. Emergency Access: Hinges, latch allow door to be lifted over keeper from outside compartment on inswing doors.
3. Materials: Stainless Steel 18-8, Type 304, heavy-gauge stainless steel with satin finish.

4. Fastening: Hardware secured to door and stile by theft-resistant, pin-in-head Torx stainless steel machine screws into factory-installed, threaded inserts.
5. Door Latch: Track of door latch prevents inswing doors from swinging out beyond stile; on outswing doors, door keeper prevents door from swinging in beyond stile; 16 gauge (1.6 mm) sliding door latch, 14 gauge (2 mm) keeper.
6. Locking: Door locked from inside by sliding door latch into keeper.
7. Hinge Type:
    a. Standard.
        1) Balanced, with field-adjustable cam to permit door to be fully closed or partially open when compartment is unoccupied.
        .
8. Mounting Brackets:
    a. Standard Concealed.
        1) Mounting Brackets: Mounted inside compartment; exposed brackets on exterior of compartment not acceptable with the exception of outswing doors.
    b. Full-Height.
        1) Mounting Brackets: 18 gauge (1.2 mm) stainless steel and extend full height of panel.
        2) U-Channels: Secure panels to stiles.
        3) Angle Brackets: Secure stiles-to-walls and panels to walls.

PART 3 PRODUCTS

3.1 PREPARATION

A. Prepare substrates including but not limited to blocking and supports in walls and ceilings at points of attachment using methods recommended by the manufacturer for achieving the best result for the substrates under the project conditions.
    1. Inspect areas scheduled to receive compartments for correct dimensions, plumbness of walls, and soundness of surfaces that would affect installation of mounting brackets.
    2. Verify spacing of plumbing fixtures to assure compatibility with installation of compartments.

B. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.

C. Do not proceed with installation until substrates have been properly prepared with blocking and supports in walls and ceilings at points of attachment and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

3.2 INSTALLATION

A. Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:
    1. Verify blocking and supports in walls and ceilings has been installed properly at points of attachment.
    2. Verify location does not interfere with door swings or use of fixtures.
    3. Use fasteners and anchors suitable for substrate and project conditions
    4. Install units rigid, straight, plumb, and level.
    5. Conceal evidence of drilling, cutting, and fitting to room finish.
    6. Test for proper operation.

3.3 ADJUSTING, CLEANING AND PROTECTION

A. Adjust hardware for proper operation after installation. Set hinge cam on in-swinging doors to hold doors open when unlatched. Set hinge cam on out-swinging doors to hold unlatched doors in closed position.

B. Touch-up, repair or replace damaged products.

C. Clean exposed surfaces of compartments, hardware, and fittings.

END OF SECTION

SECTION 10 28 10

TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Toilet and Bath Accessories
2. Warm-air dryers.

1.3 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

PART 2 - PRODUCTS

2.1 MANUFACTURERES

A. Basis-of-Design Products: The design for toilet and bath accessories described in Part 2 are based on products indicated. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. Toilet and Bath Accessories:
    a. A & J Washroom Accessories, Inc.
    b. American Specialties, Inc.
    c. Bobrick Washroom Equipment, Inc.
    d. Bradley Corporation.
    e. General Accessory Manufacturing Co. (GAMCO).
    f. McKinney/Parker Washroom Accessories Corp.

2. Warm-Air Dryers
    a. A & J Washroom Accessories, Inc.
    b. American Dryer, Inc.
    c. American Specialties, Inc.
    d. Bobrick Washroom Equipment, Inc.
    e. Bradley Corporation.
    f. Excel Dryer Corporation.
    g. General Accessory Manufacturing Co. (GAMCO).

h. McKinney/Parker Washroom Accessories Corp.
i. World Dryer.

2.2 MATERIALS

A. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

B. Stainless Steel: ASTM A 666, Type 304, No. 4 finish (satin), 0.0312-inch (0.8-mm) minimum nominal thickness, unless otherwise indicated.

C. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of [six] <Insert number> keys to Owner's representative.

2.3 TOILET AND BATH ACCESSORIES

A. Toilet and Bath Accessories:

1. Mirrors **(TBA-1)**
   a. Manufacturers
      1) Gardner Glass Products.
      2) Messer Industries, Inc.
      3) VVP America, Inc.;
      4) Binswanger Mirror Products.
   b. 1 piece 24” x 36” & 1 piece 72” x 36” framed mirror unit (verify with owner)
   c. Nominal Thickness: ¼” glass
   d. Glass: tempered clear
   e. Mounting: satin stainless steel j-channels, top and bottom

2. Paper Towel Dispensers **(TBA-2)**
   a. Manufacturer: Bobrick
   b. Model #: B-35903
   c. Finish: satin finish stainless steel
   d. Capacity: dispenses 350 c-fold or 475 multi-fold towels.
   e. Access: door equipped with stainless steel piano hinge at bottom; swings down for easy filling.
   f. Mounting: recessed cabinet (flush mount),
   g. Dimensions: rough wall opening: 11 ¼” x 18 5/8” H x 4” min. depth
   h. Avg. Mtg. Ht.: 66”

3. Doorstops **(REFER TO DOOR HARDWARE SPEC’S)**
   a. Manufacturer: Sugatsune
   b. Web Address: http://www.myknobs.com/sugbataccol.html
   c. Model #: DSD-03/M
   d. Finish: satin stainless steel and black rubber

4. Grab Bars **(TBA-3)**
   a. Manufacturer: Bobrick
   b. Model # B-6806x
   c. Avg. Mtg. Ht.: 36”
   d. Mounting: concealed mounting with snap flange (1/8” stainless steel plate)
   e. Dimensions
      1) 36” L, 1 ½” dia. beside toilet
      2) 42” L, 1 ½” dia. behind toilet

5. Water Coolers w/ bottle filler: **(VERIFY MODEL WITH MEP)**
   a. Manufacturer: Elkay
   b. Model #: LMABFTLDDWSLC
   c. Description: 2-level drinking fountain with bottle filler
   d. GPH Capacity: 8.0
   e. Shipping Wt.: 98 lbs.

6. Custodian's Utility Shelf **(CUS)**
   a. Basis of Design: B-224
      1) 18-gauge satin finish stainless steel combination shelf, mop holder, rag holder & drying rod
      2) 36" long X 8" deep
      3) 4 mop holder
      4) 3 rag hooks
      5) 23" drying rod
      6) Provide 1 in each janitors closet

7. Toilet Tissue Dispensers: **(TBA-4)**
   a. Basis of Design: Recessed Type with storage for extra roll.
   b. Model #: B-4288
   c. Finish: satin stainless steel, (satin) plastic spindle
   d. Capacity: 2 - 5 ¼" rolls (one concealed behind the other)
   e. Mounting: flush mount
   f. Dimensions: 6 ¼" W, 11 ¼" H

8. Liquid-Soap Dispenser **(TBA-5)**
   a. Basis-of-Design Product: B-8236
   b. Stainless-Steel Soap Valve: Designed for dispensing soap in liquid form.
   c. Mounting: Deck mounted on vanity.
   d. Capacity: 34 oz Translucent, shatter-resistant polyethylene.
   e. Material and Finish: Stainless steel Type 304 with bright polished finish

9. Warm-Air Dryer **(TBA-6)**
   a. Basis-of-Design Product: B-7128
   b. Type: Electronic sensor activated
   c. Mounting: Surface
   d. Material and Finish: 22-gauge type-satin stainless steel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION

BOBRICK

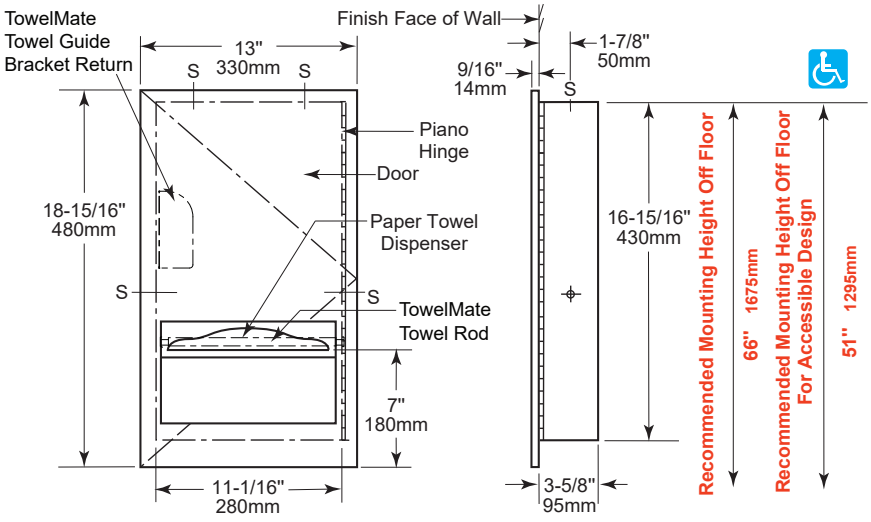
Technical Data

RECESSED PAPER TOWEL DISPENSER

B-35903

Specify Finish Required

- ☐ Stainless Steel, Satin Finish
- ☐ Matte Black Finish, please use model no. B-35903.MBLK



Rough Wall Opening
11-1/2" (290mm) wide
17-1/4" (440mm) high
3-3/4" (95mm) minimum recessed depth

MATERIALS:

Cabinet — 18-8, type-304, heavy-gauge stainless steel. All-welded construction. Exposed surfaces have satin finish.

Door — 18-8, type-304, 18-gauge (1.2mm) stainless steel. 9/16" (14mm) 90° return edges for maximum rigidity. Secured to cabinet with a concealed, full-length stainless steel piano-hinge. Equipped with a stainless steel cable door-swing limiter and friction catch.

Paper Towel Dispenser — 18-8, type-304, 22-gauge (0.8mm) stainless steel. Capacity: 300 C-fold or 400 multifold paper towels. TowelMate consisting of a 90° return towel guide angle inside cabinet to prevent paper towels from falling forward out when door is opened for servicing

TowelMate® Towel Rod Assembly — Consisting of a round Nylon Rod and (2) stainless steel Rod Screws for attachment, is field replaceable. Stainless steel Stop Screws (2) lock TowelMate Rod assembly in place. To retrofit TowelMate into existing installed units manufactured prior to Feb. 2021, order TowelMate Accessory Bobrick Model No. 369-130.

OPERATION:

Paper towel dispenser accommodates C-fold and multifold paper towels without adjustment or use of adapters. Door-swing limiter prevent damage to washroom accessories and walls.

INSTALLATION:

Provide framed rough wall opening 11-1/2" wide x 17-1/4" high (290 x 440mm). Minimum recessed depth required from finish face of wall is 3-3/4" (95mm). Allow clearance for construction features that may protrude into rough wall opening from opposite wall. Coordinate with mechanical engineer to avoid pipes, vents, and conduits in wall. Mount cabinet with shims between framing and cabinet at all points indicated by an *S*, then secure unit with sheet-metal screws furnished by manufacturer.

SPECIFICATION:

Recessed paper towel dispenser shall be type-304 stainless steel with all-welded construction; exposed surfaces shall have satin finish. Unit equipped with TowelMate consisting of a 90° return towel guide angle inside cabinet to prevent paper towels from falling forward out when door is opened for servicing and a Nylon Rod across the center of the towel tray to dispense paper towels one at a time Door shall be 18 gauge (1.2mm); have 9/16" (14mm) 90° return edges; be secured to cabinet with a concealed, full-length stainless steel piano-hinge; and equipped with a stainless steel cable door-swing limiter and friction catch. Paper towel dispenser shall be able to dispense 300 C-fold or 400 multifold paper towels without adjustment or adapters

Recessed Paper Towel Dispenser shall be Model B-35903 of Bobrick Washroom Equipment, Inc., Clifton Park, New York; Jackson, Tennessee; Los Angeles, California; Bobrick Washroom Equipment Company, Scarborough, Ontario; Bobrick Washroom Equipment Pty. Ltd., Australia; and Bobrick Washroom Equipment Limited, United Kingdom.

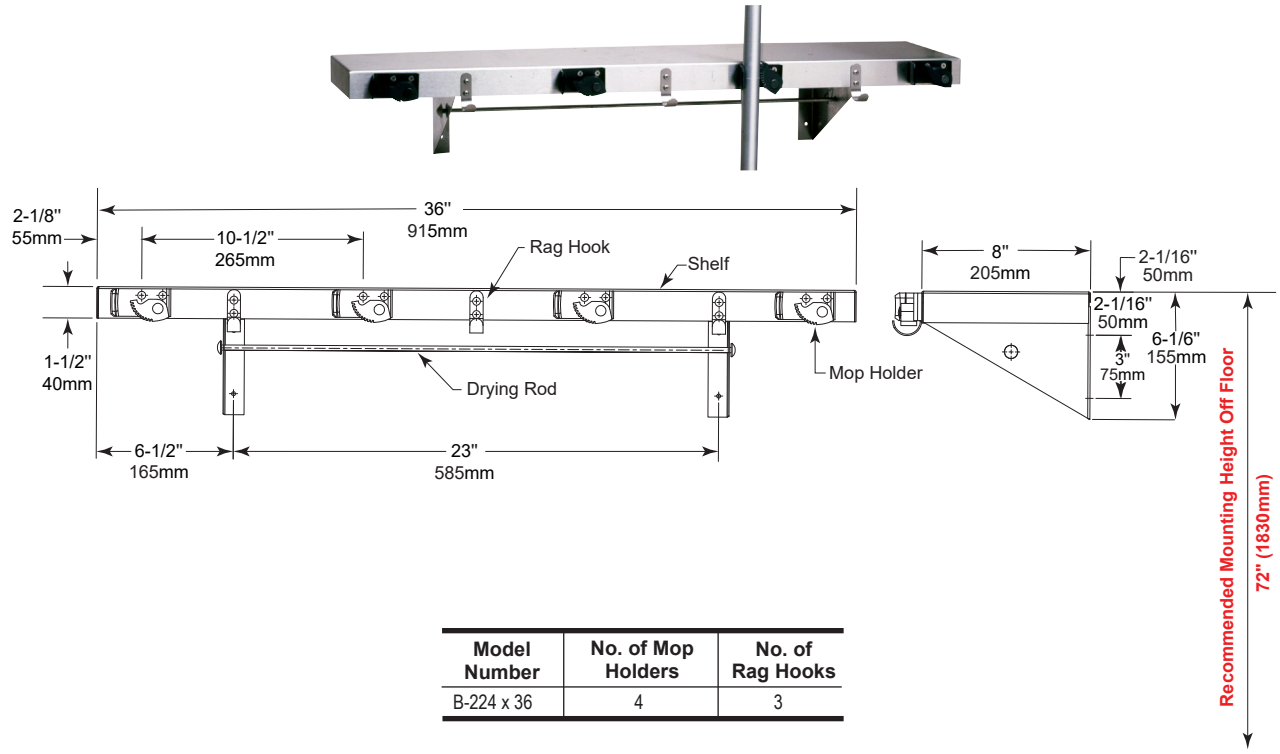
B-35903 r9/15/21 Printed in U.S.A.

BOBRICK

Technical Data

UTILITY SHELF WITH MOP/BROOM HOLDERS AND RAG HOOKS

B-224



Model Number	No. of Mop Holders	No. of Rag Hooks
B-224 x 36	4	3

MATERIALS:

Shelf — 18-8, Type 304, 18-gauge (1.2mm) stainless steel with satin finish. Shelf has 1-1/2" (38mm) return edge for maximum rigidity.

Mounting Brackets — 18-8, Type 304, 18-gauge (1.2mm) stainless steel with satin finish; welded to shelf.

Mop/Broom Holders — Spring-loaded rubber cams with anti-slip coating.

Rag Hooks — 18-8, Type 304, 16-gauge (1.6mm) stainless steel with satin finish; secured to shelf with rivets.

Drying Rod — 18-8, Type 304, 1/4" (6mm) diameter stainless steel with satin finish.

OPERATION:

Surface-mounted utility shelf with holders is designed to keep mops and brooms away from wall. Spring-loaded rubber cam holders accommodate mop or broom handles from 7/8" to 1-1/4" (22–32mm) diameter. Hooks for conveniently storing rags are located on front of shelf. Rod for hanging wet rags is located below shelf between mounting brackets.

INSTALLATION:

Secure unit to wall with four sheet-metal screws, furnished by manufacturer, at points indicated by an *S*. For plaster or dry wall construction, provide concealed backing to comply with local building codes, then secure unit with sheet-metal screws furnished. For other wall surfaces, provide fiber plugs or expansion shields for use with sheet-metal screws furnished, or provide 1/8" (3mm) toggle bolts or expansion bolts.

SPECIFICATION:

Surface-mounted utility shelf with mop/broom holders and rag hooks shall be Type 304 stainless steel with satin finish. Shelf shall be 18 gauge (1.2mm) with 1-1/2" (38mm) return edge. Mounting brackets, welded to shelf, shall be 18 gauge (1.2mm).

Utility Shelf With Mop/Broom Holders And Rag Hooks shall be Model 224x36 of Bobrick Washroom Equipment, Inc., Clifton Park, New York; Jackson, Tennessee; Los Angeles, California; Bobrick Washroom Equipment Company, Scarborough, Ontario; Bobrick Washroom Equipment Pty. Ltd., Australia; and Bobrick Washroom Equipment Limited, United Kingdom.

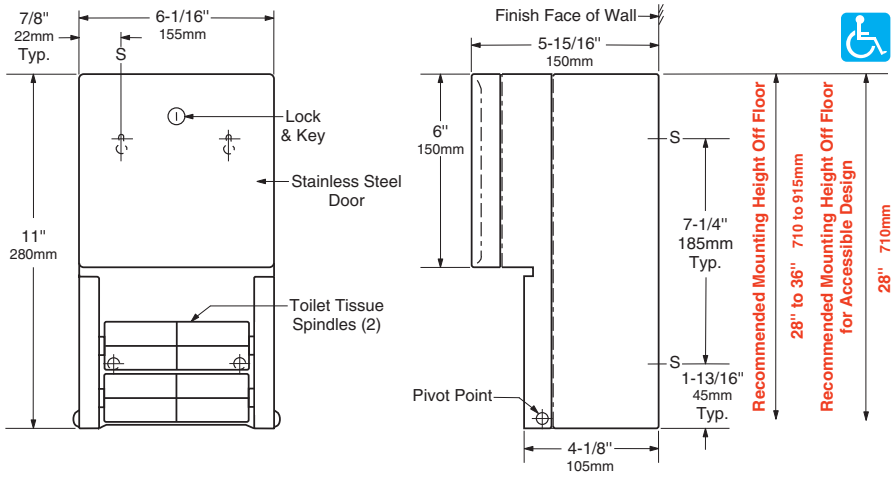
Rev. 4/27/20, R/A, S/D Printed in U.S.A.

BOBRICK

Technical Data

ConturaSeries® SURFACE-MOUNTED MULTI-ROLL TOILET TISSUE DISPENSER

B-4288



MATERIALS:

Cabinet — 18-8, type-304, 22-gauge (0.8mm) stainless steel. All-welded construction. Exposed surfaces have satin finish. Radius on top corners of cabinet match corners and edges of door.

Door — 18-8, type-304, 22-gauge (0.8mm) stainless steel with 18-gauge (1.2mm) stainless steel door frame. Exposed surfaces have satin finish. Front of door is drawn, one-piece, seamless construction and has same degree of arc as other Bobrick ConturaSeries washroom accessories. Radius on corners and edges of door match top corners of cabinet and other ConturaSeries accessories. Secured to cabinet with two rivets. Equipped with a flush tumbler lock keyed like other Bobrick washroom accessories.

Dispensing Mechanism, Inner Housing and Cam — 18-8, type-304, 18-gauge (1.2mm) stainless steel.

Spindles (2) — Heavy-duty, one-piece, molded ABS. Theft-resistant. Retained in dispensing mechanism when door is locked.

OPERATION:

Unit holds two standard-core toilet tissue rolls up to 5-1/4" (133mm) diameter (1800 sheets). Tissue rolls are loaded and locked into dispensing mechanism. Extra roll automatically drops in place when bottom roll is depleted. Depleted rolls can only be removed after unlocking door.

INSTALLATION:

For partitions with particleboard or other solid core, secure with four #10 x 5/8" (4.8 x 16mm) sheet-metal screws (not furnished) at points indicated by an *S*, or provide through-bolts, nuts, and washers.

For hollow-core metal partitions, provide solid backing into which the sheet-metal screws can be secured. If two units are installed back-to-back, then provide threaded sleeves and machine screws for the full thickness of partition.

For plaster or dry wall construction, provide concealed backing to comply with local building codes, then secure unit with sheet-metal screws.

For other wall surfaces, provide fiber plugs or expansion shields for use with sheet-metal screws, or provide 3/16" (5mm) toggle bolts or expansion bolts.

SPECIFICATION:

Surface-mounted multi-roll toilet tissue dispenser shall be type-304 stainless steel with all-welded construction, including dispensing mechanism, inner housing and cam; exposed surfaces shall have satin finish. Front of toilet tissue dispenser door shall be drawn, one-piece, seamless construction and shall have same degree of arc and match other Bobrick ConturaSeries® accessories in the washroom. Radius on corners and edges of door and cabinet shall complement other Bobrick ConturaSeries® washroom accessories. Door shall be secured to cabinet with two rivets and equipped with a flush tumbler lock keyed like other Bobrick washroom accessories. Unit shall dispense two standard-core toilet tissue rolls up to 5-1/4" (133mm) diameter (1800 sheets). Extra roll shall automatically drop in place when bottom roll is depleted. Unit shall be equipped with two theft-resistant, heavy-duty, one-piece, molded ABS spindles.

Surface-Mounted Multi-Roll Toilet Tissue Dispenser shall be Model B-4288 of Bobrick Washroom Equipment, Inc., Clifton Park, New York; Jackson, Tennessee; Los Angeles, California; Bobrick Washroom Equipment Company, Scarborough, Ontario; Bobrick Washroom Equipment Pty. Ltd., Australia; and Bobrick Washroom Equipment Limited, United Kingdom.

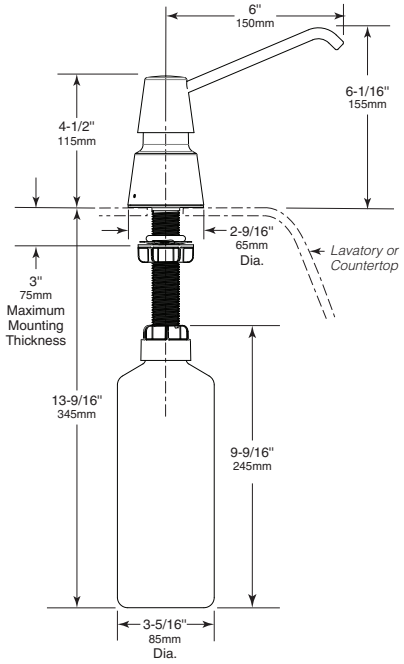
Revised 4/27/11 Printed in U.S.A.

BOBRICK

Technical Data

TOP-FILL COUNTER-MOUNTED MANUAL FOAM SOAP DISPENSER

B-8236



MATERIALS:

Spout — Type-304 stainless steel with bright polished finish.

Cover Shell — High polished deep drawn stainless steel.

Cover Spacer — Rigid, impact-resistant Acetal.

Escutcheon — Chrome-plated, die-cast metal, concealed locking mechanism.

Integrated Funnel — Red polypropylene plastic.

Body, Foam Pump and Shank — High-impact-resistant Acetal.

Valve — High impact resistant Acetal cylinder & piston. Stainless steel springs.

Container — Translucent, shatter-resistant polyethylene. Capacity: 34-fl oz (1.0-L).

OPERATION:

Press down on Cover Shell to dispense commercially marketed all-purpose foam soaps. Vandal-resistant spout can rotate 360° without damage to unit. Escutcheon locks to body with concealed locking mechanism that is opened with special key provided. To fill with foam soap only from top, unlock cover and Foam Dispensing assembly. Unit may also be filled by removing container from below counter.

Designer's Note: Bobrick foam soap dispensers are designed to dispense commercially marketed all-purpose foam hand soaps.

INSTALLATION:

Unit is designed for installation in 1" (25mm) diameter hole in porcelain-enameled steel, cast-iron or vitreous-china lavatories, as well as in countertops adjacent to lavatories. Unit may be mounted in unused faucet hole or through special hole requisitioned when counter is ordered from manufacturer (specify punching location). Shank accommodates maximum 3" (76mm) mounting thickness and can be cut in the field. Clearance required for container diameter is 3-3/8" (85mm).

SPECIFICATION:

Top-fill counter-mounted manual foam soap dispenser shall dispense 7ml of foam using 0.5ml of commercially marketed foam soaps. Cover shall be constructed of durable high polished deep drawn stainless steel zinc with bright polish finish. Spout assembly shall be Type-304 stainless steel with bright polished finish. Dispenser shall be equipped with integrated funnel to facilitate re-filling of soap. Spout shall rotate 360° without damage to valve mechanism. Escutcheon shall lock to body with concealed locking mechanism that is opened with special key provided. Foam Dispensing assembly shall be removable from top for filling and maintenance. Shank shall accommodate mounting thicknesses up to 3" (76mm). Translucent, shatter-resistant polyethylene container shall have a capacity of 34-fl oz (1.0-L).

Top-Fill Counter-Mounted Manual Foam Soap Dispenser shall be Model B-8236 of Bobrick Washroom Equipment, Inc., Clifton Park, New York; Jackson, Tennessee; Los Angeles, California; Bobrick Washroom Equipment Company, Scarborough, Ontario; Bobrick Washroom Equipment Pty. Ltd., Australia; and Bobrick Washroom Equipment Limited, United Kingdom.

Issued 2/17/22

BOBRICK

Technical Data

QuietDry™ Series TrimDry™ SURFACE-MOUNTED ADA DRYER

B-7120
B-7128

Specify Voltage Required:

- ☐ B-7120 Dryer with White Painted Cover
- ☐ B-7128 Dryer with Stainless Steel Cover

Specify model number followed by voltage required. Example: B-7128 115V for 115-volt Stainless steel cover hand dryer.

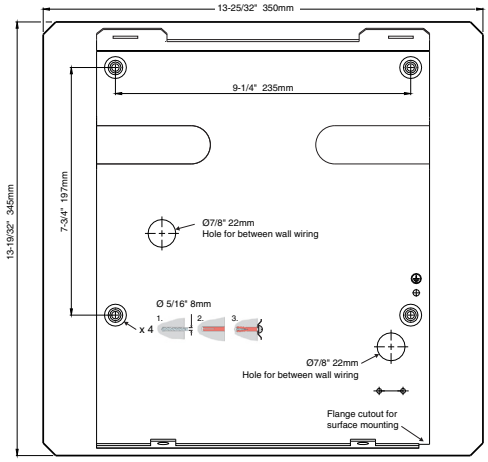
Specify Voltage Required:

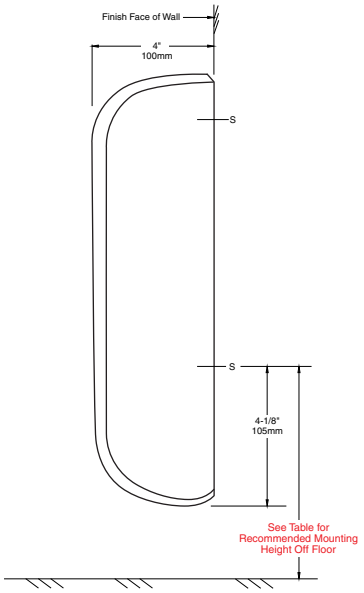
- ☐ 115V AC, 15 Amp, 1725 Watts, 50/60 Hz, Single Phase, cULus Listed.
- ☐ 208–240V AC, 6.8-7.8 Amp,1400-1900 Watts, 50/60 Hz, Single Phase, cULus Listed, VDE approved and CE marked.

***RECOMMENDED MOUNTING HEIGHTS**

Children's Washrooms, ages 3-4	36"	(915mm)
Children's Washrooms, ages 5-8	40"	(1015mm)
Children's Washrooms, ages 9-12	44"	(1120mm)
Universal Design	48"	(1219mm)

*Bottom screw hole of mounting base to finish face of floor





MATERIALS:

Cover — 22-gauge galvanized steel with exposed surface type-304 stainless steel with #4 satin-finish vertical grain (B-7128) or 22-gauge mild steel zinc plated with high-gloss white epoxy paint finish (B-7120) covers with UL 94-5VA black plastic trim and side panels. Cover equipped with uniquely designed dual air outlets. Air-inlet is equipped with vandal-resistant grille. Cover projects no more than 4" (100mm) from wall and is secured to mounting base with two vandal-resistant, recessed hex screws.

Mounting Base — 20-gauge (1.5mm) plated steel with four 0.236" (6mm) diameter mounting holes.

Motor — Universal, 1/7 hp, 8000 rpm, on resilient mounting. Sealed ball bearing at drive-shaft end and self-lubricating sleeve bearing at nondrive end. Equipped with automatic thermal-overload switch.

Fans — Two balanced, double-inlet centrifugal fans are mounted on motor shaft; directs airflow over heating element at 71 cfm.

Heating Element — Two coiled nickel-chrome heating elements are mounted in mica frame and protected by automatic thermal-overload switches. Heating elements, heat air without hot spots — inaccessible to vandals.

Electronic Control — Infrared sensor automatically turns dryer on when hands are held under air-outlet opening and across path of sensor. Remove hands from path of sensor and dryer stops. Electronic sensor has automatic shutoff approximately 1-1/2 minutes after dryer turns on if an inanimate object is placed across air-outlet opening. After inanimate object is removed, electronic sensor automatically resets itself and dryer operates normally.

continued . . .

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OPERATION:

No-touch operation: electronic sensor automatically turns dryer on when hands are held under air-outlet opening and across path of sensor. Dual air outlets provide a swirling circulation of airflow for comfortable hand drying. Drying time less than 25 seconds. Remove hands from path of sensor and dryer stops. Dryer operates only when actually drying hands, which saves energy and operating costs. Electronic sensor will automatically shut dryer off 1-1/2 minutes after dryer turns on if an inanimate object, such as tape or chewing gum, is placed across air-outlet opening. After inanimate object is removed, electronic sensor automatically resets itself and dryer operates normally.

10-Year Limited Warranty — In addition to Bobrick's one-year guarantee, Bobrick extends a limited 10-year warranty from the date of purchase on all parts for Model B-7120 and B-7128 hand dryer, except motor brushes, to the original owner of the installed unit against defects in factory workmanship or material under normal use and service. Motor brushes are warranted for three years from date of purchase. This warranty is limited to the repair or exchange of defective parts at the option of Bobrick. See Installation Instruction Sheet, Form No. 712-69, for full details.

INSTALLATION:

Wall preparation: Locate mounting base on wall using template provided. For brick, stone, and concrete walls drill four 0.315" (8mm) holes to suit provided wall plugs 0.315" (8mm) x 1-1/4" (45mm) and screws # 10 (4.8mm) x 2" (50mm) long. See template for wall plug and screw installation details. For plaster or dry wall construction, provide concealed backing to comply with local building codes and secure with four #10 (4.8) round-head sheet-metal screws or 3/16" (5mm) toggle bolts (not furnished). Provide electrical service from nearest distribution panel to dryer mounting base in conformance with local electrical codes.

Wiring Instructions:

1. For 115-Volt Dryers — Connect ground wire to ground terminal marked ⏚, the black or *hot* wire to terminal marked *L1,* and neutral or white wire to terminal marked *N*.
2. For 208–240-Volt Dryers — Connect ground wire to ground terminal marked ⏚ and the 208-240-volt wires to terminal marked *L1* and *L2*.

Notes: Electronic sensor in Automatic dryers will pick up movement within 6" (150mm) of the air-outlet opening. Use caution when choosing location for Automatic dryers in confined areas. Consider proximity to doorways and other traffic areas.

Bobrick automatic hand dryers should be installed at least 15" (380mm) above any projection or horizontal surface which may interfere with the operation of the automatic sensor.

For installation instructions that include step-by-step installation procedures and details of electrical service connections, see Form No. 712-69, which is packed with each shipment. This form is also available in advance upon request.

SPECIFICATION:

Surface-mounted hand dryer shall have either 22-gauge galvanized steel with exposed surface type-304 stainless steel with #4 satin-finish vertical grain (B-7128) or 22-gauge mild steel zinc plated with high-gloss white epoxy paint finish (B-7120) covers with UL 94-5VA black plastic trim. Slim profile cover shall project no more than 4" (100mm) from the finished face of wall to comply with accessible design guidelines (including ADAAG in the U.S.A.). Unit shall be equipped with dual air outlets that provide a swirling circulation of airflow for (less then 25 seconds) hand dry. Motor shall be 1/7 hp, universal type on resilient mounting with sealed ball bearing at drive-shaft end and self-lubricating sleeve bearing at nondrive end; equipped with automatic thermal-overload switch. Heating elements shall be located on outlet side of fan, shall heat air without hot spots, be inaccessible to vandals, and protected by an automatic thermal-overload switch. Electronic sensor shall automatically turn dryer on when hands are held under air-outlet opening and across path of sensor. Dryer shall turn off automatically when hands are removed. Sensor shall automatically shut dryer off approximately 1-1/2 minutes after dryer turns on if an inanimate object is placed across air-outlet opening. After inanimate object is removed, electronic sensor shall automatically reset itself and dryer shall operate normally. Unit shall be cULus Listed, and/or VDE approved, CE marked. Unit shall comply with EU Directive "Restriction of Hazardous Substance" (ROHS) requirements for non-use of certain hazardous substances in the production of electronic products. Unit shall be protected by a limited 10 -year warranty on all parts except motor brushes. Motor brushes shall be warranted for three years from date of purchase.

QuietDry™ Series TrimDry™ Surface-Mounted ADA Hand Dryer shall be Model B-7120 and B-7128 of Bobrick Washroom Equipment, Inc., Clifton Park, New York; Jackson, Tennessee; Los Angeles, California; Bobrick Washroom Equipment Company, Scarborough, Ontario; Bobrick Washroom Equipment Pty. Ltd., Australia; and Bobrick Washroom Equipment Limited, United Kingdom.

B-7120 Rev. 8/1/15 Printed in U.S.A.

SECTION 10 35 00

FLAGPOLES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes ground-set flagpoles made from aluminum.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide flagpoles capable of withstanding the effects of wind loads, determined according to NAAMM FP 1001, "Guide Specifications for Design of Metal Flagpoles."

1. Base flagpole design on polyester flags of maximum standard size suitable for use with flagpole.
2. Basic Wind Speed: **140 mph**; 3-second gust speed at 33 feet aboveground.

1.3 SUBMITTALS

A. Product Data: For each type of flagpole required.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Flagpole; a Kearney-National Inc. Company.
2. Baartol Company Inc. (The)
3. Concord Industries, Inc.
4. Eder Flag Manufacturing Company, Inc.
5. Ewing International.
6. Lingo Inc.; Acme Flagpole Division.
7. Michigan Flagpole Inc.
8. Morgan-Francis Div.; Original Tractor Cab Co., Inc.
9. Pole-Tech Company Inc.

2.2 FLAGPOLES

A. Flagpole Construction, General: Construct flagpoles in one piece if possible. If more than one piece is necessary, provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.

B. Exposed Height: **30 feet**

C. Aluminum Flagpoles: Provide cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B 241, Alloy 6063, with a minimum wall thickness of 3/16 inch. Heat treat after fabrication to comply with ASTM B 597, Temper T6.

D. Foundation Tube: Galvanized corrugated-steel foundation tube, 0.064-inch- minimum nominal wall thickness. Provide with 3/16-inch steel bottom plate and support plate; 3/4-inch- diameter, steel ground spike; and steel centering wedges all welded together. Galvanize steel parts, including foundation tube, after assembly. Provide loose hardwood wedges at top of foundation tube for plumbing pole. Provide flashing collar of same material and finish as flagpole.

E. Cast-Metal Shoe Base: For anchor-bolt mounting; provide with anchor bolts.

2.3 FITTINGS

A. Finial Ball: Manufacturer's standard flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter; finished to match flagpole.

B. Internal Halyard, Winch System: Manually operated winch with control stop device and removable handle, stainless-steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Provide flush access door secured with cylinder lock. Finish truck assembly to match flagpole.

C. Halyard Flag Snaps: Provide two swivel snap hooks per halyard.

D. Elastomeric Joint Sealant: Single-component urethane or single-component neutral-curing silicone joint sealant complying with requirements in Division 7 Section "Joint Sealants" for Use NT (nontraffic) and for Use M, G, A, and, as applicable to joint substrates indicated, O joint substrates.

2.4 FINISHES

A. Aluminum: Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

1. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 FLAGPOLE INSTALLATION

A. General: Install flagpoles where shown and according to manufacturer's written instructions.

B. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.

C. Foundation-Tube Installation: Install flagpole in foundation tube, seated on bottom plate between steel centering wedges. Plumb flagpole and install hardwood wedges to secure flagpole in place.

Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch layer of elastomeric joint sealant and cover with flashing collar.

D. Baseplate Installation: Install baseplate on washers placed over leveling nuts on anchor bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten retaining nuts and fill space under baseplate solidly with nonshrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from edges of baseplate.

END OF SECTION

SECTION 10 44 13

FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Portable fire extinguishers
   2. Fire-protection cabinets.

1.2 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection specialties.
   1. Fire Extinguishers: Include rating and classification.
   2. Cabinets: Include door hardware, cabinet type, trim style, panel style, and details of installation.

B. Samples: For each exposed cabinet finish.

1.3 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1.4 COORDINATION

A. Coordinate size of cabinets to ensure that type and capacity of hoses, hose valves, and hose racks indicated are accommodated.

PART 2 - PRODUCTS

2.1 PORTABLE FIRE EXTINGUISHERS

A. General: Provide fire extinguishers as identified on building plans for residential buildings. Locate portable fire extinguishers as required by local fire marshal in clubhouse(s).
   1. Mounting Brackets: Manufacturer's standard steel, designed to secure extinguisher indicated and with plated or baked-enamel finish.
   2. Identification: Lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location. Locate as directed by Architect.
      a. Identify bracket-mounted extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to wall surface.

B. Extinguishers:
   1. General: Provide fire extinguishers for each cabinet in locations indicated.
      a. Mounting Brackets: Manufacturer's standard steel, designed to secure extinguisher indicated and with plated or baked-enamel finish.

b. Identification: Lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location. Locate as directed by Architect.
1) Identify bracket-mounted extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to wall surface.

2. Capacity and UL Rating: As required by Code.
3. Tank: DOT approved steel cylinder.
4. Metal valves and siphon tube.
5. Replaceable molded valve stem seal.
6. Pressure gauge.

2.2 FIRE-PROTECTION CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. J. L. Industries, Inc.
2. Larsen's Manufacturing Company.
3. Potter-Roemer; Div. of Smith Industries, Inc.
4. Kidde

B. Fire Protection Cabinet:
1. Cabinet: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.
a. Fire-Rated Cabinets: Listed and labeled to meet requirements in ASTM E 814 for fire-resistance rating of wall where it is installed.
b. Cabinet Metal: Enameled-steel sheet.
2. Mounting: Semi-recessed– locate as shown on plans.
3. Door:
a. Material: Break-glass, tempered glass.
b. Construction: Fabricate doors according to manufacturer's standards, of materials indicated, and coordinated with cabinet types and trim styles selected.
1) Provide inside latch and lock for break-glass panels.
c. Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam-action latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 degrees.
d. Door Locks: Provide cylinder lock, with all cabinets keyed alike.

C. Wall Bracket: Manufacturer's standard J-type for wall hung extinguishers.

2.3 FINISHES

A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.

B. Steel, Factory Priming for Field-Painted Finish: Apply manufacturers or fabricator's standard, fast-curing, lead- and chromate-free, universal primer shop primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets are to be installed.

B. Examine fire extinguishers for proper charging and tagging. Remove and replace damaged, defective, or undercharged units.

C. Install in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
   1. Prepare recesses for cabinets as required by type and size of cabinet and trim style.
   2. Fasten mounting brackets to structure and cabinets, square and plumb.
   3. Fasten cabinets to structure, square and plumb.

D. Adjust cabinet doors that do not swing or operate freely.

E. Refinish or replace cabinets and doors damaged during installation.

F. Place extinguishers in cabinets and on wall brackets.

END OF SECTION

SECTION 10 44 50

DOOR AND ROOM SIGNS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Dimensional characters (letters and numbers) for interior.
   2. Signage accessories.

B. Related Sections include the following:
   1. Division 10 Section "Post and Panel Signs" for freestanding exterior panel signs, including accessible parking signs.
   2. Division 15 Section "Mechanical Identification" for labels, tags, and nameplates for mechanical equipment.
   3. Division 16 Section "Electrical Identification" for labels, tags, and nameplates for electrical equipment.
   4. Division 16 Section "Interior Lighting" for illuminated exit signs.

1.3 SUBMITTALS

A. Shop Drawings: Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.
   1. Provide message list for each sign, including large-scale details of wording, lettering, and Braille layout.

B. Samples for Initial Selection: For each type of sign material indicated that involves color selection.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by signage manufacturer.

B. Source Limitations: Obtain each sign type through one source from a single manufacturer.

C. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.
   1. Interior Code Signage: Provide signage as required by accessibility regulations and requirements of authorities having jurisdiction. These include, but are not limited to, the following:
      a. Illuminated Exit Signs: Refer to Division 16.

1.5 PROJECT CONDITIONS

A. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.

1.6 COORDINATION

1. For signs supported by or anchored to permanent construction, furnish templates for installation of anchorage devices.

PART 2 - PRODUCTS

2.1 DIMENSIONAL CHARACTERS

A. Cutout Characters: Cut characters from ¼" stainless steel plate . Produce precisely cut characters with square cut, smooth**,** eased edges. Comply with requirements indicated for finish, style, and size.

1. Stainless Steel; @ Receptionist Desk
   a. Finish: Brushed Aluminum
   b. Style: Garmond Font, verify with owner.
   c. Size: 8", verify with owner.

2.2 ACCESSORIES

A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.3 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify that items, including anchor inserts, provided under other sections of Work are sized and located to accommodate signs.

C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.
   1. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

3.4 INTERIOR ROOM SIGN SCHEDULE

A. Sign Type: provide sample for owner review per 1.3 Submittals
   1. Sign Size: Manufacturer’s standard size.
   2. Material: Clear acrylic with black vinyl text (font by owner)
   3. Background Finish/Color: Clear
   4. Character Finish/Color: Black vinyl text lettering
   5. Character Size: 1”
   6. Text/Message: Room Name and Number as per plan; verify with owner.
   7. Quantity: One for each room, confirm with owner.

END OF SECTION

SECTION 32 40 00

SITE FURNISHING

SECTION 324000 - SITE FURNISHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Bench Seating.
2. Trash Receptacle.
3. Light Bollard.
4. Tree Uplight.
5. Pole Light.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installing anchor bolts cast concrete footings.
2. Section 312000 "Earth Moving" for excavation for installing concrete footings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For site furnishings.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For site furnishings to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 BENCH SEATING

A. Products: Subject to compliance with requirements, **provide the following**:

1. **Landscape Forms; Socrates Bench, 95" bench** or comparable product approved by Landscape Architect.

2.2 TRASH RECEPTACLE

A. Products: Subject to compliance with requirements, **provide the following**:

1. Victor Stanley**; Sage Receptacle (SGE-36SA)** or comparable product approved by Landscape Architect.

2.3 LIGHT BOLLARD

A. Products: Subject to compliance with requirements, **provide the following**:

1. **BEGA; Asymmetric Bollard 84_413** or comparable product approved by Landscape Architect.

2.4 TREE UPLIGHT

A. Products: Subject to compliance with requirements, **provide the following**:

1. **BEGA; symmetrical floodlight 77018** or comparable product approved by Landscape Architect.

2. 2 per tree as shown on Landscape Drawings.

2.5 POLE LIGHT

A. Products: Subject to compliance with requirements, **provide the following**:

1. BEGA**; Asymmetric Pole Top 99599.K4, 25RFNS1 (25FT pole)**

2.6 GENERAL FINISH REQUIREMENTS

A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.8 STEEL AND GALVANIZED-STEEL FINISHES

A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

B. PVC Finish: Manufacturer's standard, UV-light stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on, PVC-plastisol finish, with flame retardant added; complying with coating manufacturer's written instructions for pretreatment, application, and minimum dry film thickness.

2.9 IRON FINISHES

A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.10 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run directional finishes with long dimension of each piece.
2. Directional Satin Finish: No 4.
3. Dull Satin Finish: No. 6.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.

B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.

C. Install site furnishings level, plumb, true, and **securely anchored** at locations indicated on Drawings.

D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.

E. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and 3/4 inch (19 mm) larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with **nonshrink, nonmetallic grout**, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

F. Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with **nonshrink, nonmetallic grout**, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

END OF SECTION 324000

SECTION 32 84 00

IRRIGATION PERFORMANCE

SECTION 328400 - IRRIGATION PERFORMANCE

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. Furnish all labor, materials and equipment for the proper design and installation of an irrigation system to service the landscaped areas. The system is to be designed by a Professional Irrigation Consultant and installed by a qualified Irrigation Contractor. The design criteria of the system will be directed by the client and the owner.

1.2 SUMMARY OF WORK:

A. Extent of underground irrigation system to fully serve the proposed planted areas.

B. Provide all documents, labor, materials and equipment required by or inferred from the Drawings and Specifications to complete the Work of this section.

C. Provide additional work and materials required by local authorities at no extra cost to Owner.

1.3 QUALITY ASSURANCE:

A. Industry Reference Standards: Refer to Division 1 Reference Standards Section.

1. American Society for Testing and Materials (ASTM). D 3139-89 Specification for Joints for Plastic Pressure Piping Using Flexible Elastomeric Seals.

2. National Electric Code (NEC), 2012 Edition.

B. Qualifications:

1. Installer Qualifications: Engage a company specializing in irrigation installation.

2. Codes and Standards: Perform Irrigation Work in compliance with applicable requirements of governing authorities having jurisdiction. County regulations supersede these specifications.

4. Workmanship: Install materials and equipment in a neat and professional manner following manufacturer's recommendations.

C. Conference: Before any work is started a conference shall be held between the irrigation contractor and the Owner concerning the work under this contract.

D. The irrigation contractor shall maintain continuously a competent superintendent, satisfactory to the Owner, on the work during progress with authority to act or him in all matter pertaining to the work.

E. It is the Irrigation Contractor’s responsibility to coordinate and cooperate with the other Contractors to enable work to proceed rapidly and efficiently.

F. The irrigation contractor shall confine his operations to the area to be improved and to the areas allotted him by the CMAR for material and equipment.

G. Irrigation contractor shall take all necessary precautions to protect the existing site conditions and vegetation.

1.4 SUBMITTALS:

A. As-Built Drawings: upon completion of installation, irrigation contractor shall produce as-built drawings. These drawings shall have dimensions from easily located stationary points (cross measured) as they relate to all valves, mainlines, and wire. Clearly note all approved substitutions of size, and material. Complete, concise instruction sheets and parts lists covering all operating equipment and weathering techniques shall be bound into folders and furnished to the Owner.

F. Product Data: Submit, for information only, manufacturer's specifications, product data, installation instructions and general recommendations for **all components** of the irrigation system. Each submittal is to clearly identify the product, series/model number by use of a high lighter.

H. Installer Certification: Submit written documentation certifying that Irrigation Contractor and Irrigation Consultant complies with requirements of "Installer Qualifications" above.

1.5 SITE CONDITIONS

A. The irrigation contractor shall examine the site, plans and specifications (i.e. system requirements).

C. Adjustment of the sprinkler heads and automatic equipment will be done by the irrigation contractor, upon completion of installation, to provide optimum performance.

D. After completion, testing, and acceptance of the system, the irrigation contractor shall verbally instruct the Owner’s personnel in the operation and maintenance of the system. All written instructions shall be included in the bound maintenance package.

1.6 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials and equipment in such a manner as to not damage the parts or decrease the useful life of equipment.

B. Store materials away from detrimental elements. Coordinate with GC to secure a safe staging area.

C. Handle, load, unload, stack and transport materials for irrigation system carefully to avoid damage. Handle pipe in accordance with manufacturer's recommendations.

1.7 PROJECT CONDITIONS:

A. The site irrigation system is comprised of ***two major components***, an irrigation distribution and sprinkler system. The irrigation contractor shall connect the distribution network to the ***irrigation point of connection***. The irrigation contractor will reimburse the Owner for all work deleted and not completed.

SECTION 32 84 00

IRRIGATION PERFORMANCE

B. The Irrigation System is designed to operate under the following conditions: a minimum of 90 psi water pressure, and at least 100 gpm available water supply (*Note: Designing Contractor will be responsible to determine system requirements so that water-window does not exceed 8 hours, maximum).*

C. Insurance on irrigation materials or equipment stored or installed is the responsibility of the Irrigation Contractor. Such insurance shall cover fire, theft and vandalism. Should the irrigation contractor elect not to provide for such insurance, he will in no way hold the Owner responsible for any losses incurred by the aforementioned acts. The Irrigation Contractor is responsible for all costs incurred in replacing damaged or stolen materials or equipment prior to Substantial Completion of the Work.

D. Obtain all required permits and pay all required fees, at no additional cost to the Owner. Any penalties imposed due to failure to obtain permits or pay fees are the responsibility of the irrigation contractor.

E. Provide and maintain all passageways, guard fences, warning lights and other protection devices required by the local authorities.

F. Existing Grades: Existing grades will be within 0.2 feet of grades shown on the Civil Engineering Drawings at time of irrigation work. Determine condition of existing grades prior to beginning the Work. When irregular or incomplete grading conditions are encountered, notify the Owner in writing before beginning the Work. Perform Work in a manner which will avoid damage to finished grading and drainage resulting from the work covered in these Contract Documents shall be repaired at the Irrigation Contractor's expense.

G. Existing Site Improvements: Perform Work in a manner which will avoid possible damage. The irrigation contractor is responsible for any damage of mechanical nature as well as damage resulting from leaks in the irrigation system whether due to negligence or otherwise.

H. Test water conditions: The irrigation contractor shall check the pressure at the ***irrigation point of connection*** and confirm minimum operating pressure noted in this Specification. If minimum operating pressure cannot be obtained, notify Owner.

1. In the event the water pressure does not meet minimum operating pressure at the irrigation point of connections noted in this Specification, notify owner. The Irrigation Consultant will make recommendations concerning the development of a booster pump station capable of providing the flow and pressure required.

2. In the event the water pressure significantly exceeds the operating pressure noted in this Specification, provide a pressure regulator down stream of the backflow preventer.

I. Sleeves, if required, are to be installed by the GC. Irrigation sleeves shall be installed. If sleeving horizontal depth exceeds the requirement by 6 inches (6"), it will be the responsibility of the GC to expose the horizontal ends below finish grade. The GC is to expose irrigation sleeves for Irrigation Contractor prior to start of Irrigation Work in all areas where sleeving is not installed as per details. Coordination and scheduling for excavation of sleeve ends is the responsibility of the Irrigation Contractor.

J. Coordinate and schedule all Work with GC.

K. Damages resulting from irrigation installation to work of other trades must be repaired at the expense of the Irrigation Contractor in a timely fashion.

L. Make minor adjustments to system layout as may be required and requested at no additional cost to the Owner.

M. Keep Project Site clean and orderly at all times during construction

1.8 WARRANTY:

A. Warranty all Work for a period of one year, starting on the Date of Substantial Completion, against defects in materials, equipment, workmanship and any repairs required resulting from leaks or other defects of workmanship, material or equipment.

B. Repair unsatisfactory conditions promptly at no cost to the Owner.

C. Emergency repairs may be made by the Owner without relieving the Irrigation Contractor of his warranty obligations.

D. Repair settling of backfilled trenches occurring during the warranty period, including restoration of damaged plantings, paving or improvements resulting from settling of trenches or repair operations.

E. Respond to Owner's request for repair work within ten (10) days. If not, Owner may proceed with such necessary repairs at the irrigation contractor's expense.

F. Provide written warranty executed by pump station manufacturer that all system equipment and components will be free from all defects in material and workmanship for a period of one year after the date of Substantial Completion.

1.9 CODES AND ORDINANCES

A. All materials, installation parameters, and operations shall conform to all applicable codes and ordinances. It is the irrigation contractor’s responsibility to investigate and follow all regulations. Irrigation contractor is responsible to verify applicable codes and ordinances prior to submitting bid. Before bid submittal, it is the irrigation contractor’s responsibility to notify the Irrigation Consultant/Designer at least 5 days before bid submittal, of any changes due to code or ordinance discrepancies. If the irrigation contractor does not comply with this process and notification, the irrigation contractor shall be responsible for the necessary installation change and redesign costs for non-compliance.

1.10 PERMITS AND FEES

A. The irrigation contractor shall obtain, at his expense, all required permits and shall pay all required fees. Any penalties imposed due to failure to obtain any permit or pay any fee shall be the responsibility of the irrigation contractor.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. All Mainline piping 2-1/2” and larger shall be Class 200, SDR 21, unplasticized rigid PVC pipe with integral bell and rubber ring gasket unless otherwise specified.

B. All Mainline 2” and smaller and all lateral piping piping shall be Class 200, SDR 21, solvent weld P.V.C. pipe. 1/2" pipe shall be Class 315 solvent weld P.V.C. Pipe. All pipe shall be supplied in 20' standard lengths.

C. All pipe that is exposed or not below grade shall be Schedule 80 PVC.

D. Fittings for integral bell rubber ring gasketed pipe shall have the gasket type fittings, PVC type.

E. Fittings for all Mainline Piping 4” shall be Harco Ductile Iron Gasketed Fittings. All mainline 4” and larger shall utilize approved thrust blocking and or restraints. Thrust Blocking and restraints to be installed as per manufacturer’s recommendations for pipe type, pipe size and local environmental conditions.

F. All fittings for 2-1/2" and small mainline and all lateral piping shall be Schedule 40 solvent weld fittings rated for 200 psi (ASTM D-3139).

G. Solvent weld PVC pipe, shall be rigid PVC pipe and shall be assembled using appropriate PVC pipe cleaner/primer and solvent cement in accordance with the manufacturer's recommendations. Solvent cement shall be # 715 Gray NSF approved.

H. All solvent weld fittings shall conform to Schedule 40 or Schedule 80 PVC dimensions and specifications for solvent weld fittings.

I. Expansion Joints: Shall consist of integral bell and rubber gasket coupling, install every 300 feet of solvent weld piping.

J. Runs of pipe over 20' length must be installed with standard 20' length sections..

K. PVC Pipe Couplings Located Within Sleeves: 4" and smaller to be solvent weld. 6" and larger to be mechanical joints. Upon exiting sleeves, pipe solvent weld or integral bell and rubber gasket, as specified.

L. All plastic fittings to be installed shall be molded fittings manufactured of the same material as the pipe and shall be suitable for solvent weld, slip joint ring tight seal, or screwed connections NO fitting made of other material shall be used except as hereinafter specified.

M. Slip fitting socket tapers shall be so sized that a dry unsoftened pipe end conforming to these special provisions can be inserted no more than halfway into the socket. Plastic saddle and flange fittings will not be permitted. Only Schedule 80 pipe may be threaded.

2.2 SLEEVES

A. All sleeves shall be Class 200 PVC or stronger. All sleeves are required at every crossing indicated on drawings. (Size Noted)

B. All sleeves shall be installed under proposed pavement areas prior to subgrade and base construction.

C. Sleeves shall have a minimum horizontal separation of 18” and a maximum of twenty-four (24) inch clearance below bottom of curb.

D. All sleeves shall have a minimum horizontal separation of twenty-four (24) and maximum of (36) thirty-six inches from center to center.

E. Stub up sleeve pipe twelve (12) inches above ground surface and cap. Paint cap with fluorescent orange paint for easy identification.

F. The location of all sleeves shown on the plans is schematic. The irrigation contractor shall make any adjustments necessary to accommodate existing vegetation, utilities, or other existing conditions.

G. If the road crossings are designated as being bore locations the bore must be ample size to accommodate the size sleeve specified.

2.3 RISERS

A. Provide Threaded Schedule 80 PVC Risers. All risers above grade to be either dark gray or black PVC pipe.

2.4 ELECTRIC WIRING

A. 120 Volt AC Wiring: 120 volt service to controller shall consist of three wires: one black, one white, and one ground. Electrical service to be provided by ***Electrical Trade Contractor***

B. Splices in controller wiring shall be waterproof.

1. Acceptable Manufacturers and Products:

a. Manufacturer: 3M

(1) Product: DBR/Y-6

b. Manufacturer: 3M

(1) Product: 3577

c. Manufacturer: Paige

(1) Product: DBR/Y-6

C. Control Wiring shall be 600 volt solid wire U.L. approved for direct burial in ground. Minimum wire size: 14 gauge. Control wiring and wiring connections from the controller to the valves is included in this Contract. Common wiring minimum wire size: 12 gauge.

1. Acceptable Manufacturers and Products:

a. Manufacturer: Paige Electric Co.

b. Manufacturer: King Wire and Cable

c. Manufacturer: Spectrum Wire Corporation

2.5 SPRINKLER HEADS

A. Spray and rotary sprinklers: Provide where indicated on the drawings. All spray heads (6" & 12" pop up) shall be provided with an internal pressure regulating device. All sprinkler heads (sprays and rotary) shall have an internal check valve to minimize low head drainage and be installed on (4) four elbow swing joints. Heads shall perform to Manufacturer's Specifications concerning diameter of throw and gallonage at provided pressure.

1. Acceptable Manufacturers and Products:

a. Manufacturer: Rain Bird

(1) Product: Sprays # 1806 and # 1812 PRS-SAM

(2) Product: Rotor # 5006 (stainless steel riser)

(3) Product: Athletic Field Rotor #8005 (stainless steel riser)

b. Manufacturer: Toro

(1) Product: Sprays # 570Z-XF-6) and 570Z-XF-12P

(2) Product: Rotor # S800 (stainless steel riser)

c. Manufacturer: Hunter

(1) Product: Sprays # PS-06 and # PS-12

(2) Product: Rotor I-20 ADS (stainless steel riser)

(3) Product: Rotary Nozzle MP Rotator

(4) Product: Athletic Field Rotor #I-40 ADS (stainless steel riser)

2. Spray Heads shall be installed utilizing (3) marlex ells and rigd pvc pipe connections. Rotor heads shall be installed utilizing Lasco Swing Joints.

B. Drip Irrigation Emitters shall be of the in-line self cleaning, pressure compensating or insertable variety where indicated on drawings.

1. Acceptable Manufacturers :

a. Manufacturer: Netafim Irrigation Inc.

(1) Product: Techline CV

(2) .6 gph inline emitters, 12" inline emitter spacing, tubing spacing to be 12-18", depending on plant spacing (tubing spacing shall not exceed plant spacing)

b. Manufacturer: Rain Bird

(1) Product: XFS Dripline Tubing

(2) .6 gph inline emitters, 12” inline emitter spacing, tubing spacing to be 12-18”, depending on plant spacing (tubing spacing shall not exceed plant spacing)

2.6 AUTOMATIC CONTROLLER

A. Each controller location must be easily accessible for maintenance. Provide for the possibility of making minor timing adjustments to the controller in the field.

B. Provide controllers capable of fully automatic, as well as manual operation of the system. Controller housing is to be a wall or pedestal mounted, where noted on the drawings, in weatherproof, lockable cabinet.

C. Provide controller which operates on a minimum of 110 volts AC power input and is capable of operating 24 vole AC electric remote control valves, with a reset circuit breaker to protect from overload. Irrigation contractor is responsible for connection to 120 VAC power to controller.

D. Each station shall have a time setting which can be set for variable timing in increments from 0 to 60 minutes, or set to omit the station from the irrigation cycle.

E. The controller shall have a master "on-off" switch shall allow the valve power output to be interrupted without affecting the controller.

F. The controller shall be constructed so that all internal parts are accessible through the controller door without disturbing the cabinet installation.

G. Irrigation contractor shall a include a wireless Rain and Freeze-Clik sensor for each field controller

H. EachController shall be grounded as per American Society of Irrigation Consultants specifications.

I. Acceptable Manufacturers and Products:

1. Manufacturer: Rain Bird

   a. Product: ESP-LXM Series (Modular)

2. Manufacturer: Hunter

   a. Product: ACC Series

3. Manufacturer: Toro

   a. Product: Sentinel Series

2.7 METER

A. Owner to provide domestic irrigation water meter and which will comply with Manufacturer's Specifications and applicable local codes.

2.8 BACKFLOW PREVENTER:

A. The irrigation contractor shall provide a backflow device at the domestic irrigation water meter. The backflow preventer shall be a double check valve assembly type, capable of having a flow rate matching the system requirements with a pressure loss not to exceed ***7.5*** pounds per square inch (PSI) and shall be suitable for supply pressure up to 150 PSI. The backflow preventer body to be bronze, internal parts stainless steel, and the check valve assemblies tight seating rubber. The backflow preventer assembly must include two gate valves for isolating unit, and two ball valve test cocks for testing unit to insure proper operations. All backflow devices should conform to all local codes and regulations.

B. Acceptable Manufacturers:

1. Manufacturer: Watts

2. Manufacturer: Febco

3. Manufacturer: Wilkins

C. Backflow Preventer shall be type approved by local water authority (i.e. RPA vs DCA). Irrigation contractor shall submit backflow preventer information to local water authority for approval before starting construction.

2.9 VALVE BOXES

A. Control Valves: Shall be in a 12" x 18" Super Jumbo Valve Box with non-hinged cover.

B. Backflow Preventer: Shall be in a 20" x 34" Valve Box with non hinged cover (if DCA); .

C. Isolation Valves and Wire Splices and Quick Coupling Valves: Shall be in a 10" round valve box with cover.

D. All Valve Boxes are to be green in color with green colored covers, unless local code dictares otherwise or otherwise directly by Owner.

E. Acceptable Manufacturers:

1. Manufacturer: Carson Industries.

2. Manufacturer: Ametek

2.10 QUICK COUPLING VALVES AND KEYS

A. Quick coupling valves shall be used as a source to the pressurized main line so that a hose can be attached for manual hand watering. The quick coupling valve will be constructed of brass with a spring loaded seal that will keep the valve in a closed position until the key is inserted into the valve. The valve will also have a hinged locking purple rubber cover to prevent any debris getting into the internal mechanism of the valve. The cover shall be marked with

"Do Not Drink" in English and Spanish. All quick coupling valves will be installed on a triple elbow swing joint. Provide size as indicated on drawings.

B. Quick coupling keys shall be of the single lug variety. Attached to the key will be a hose swivel adapter sized to the commonly used hose on the project. The key and swivel will both be constructed of brass. Installation Contractor shall provide (5) Hose Swivels and Keys matching Quick Couplers installed.

C. Acceptable Manufacturers:

1. Manufacturer: Rainbird #5 Series, 1”

2. Manufacturer: Toro 100-SLVC Series, 1”

3. Manufacturer: Hunter #5 Series, 1”

2.11 CONTROL VALVES:

A. Plastic Body
Provide electric remote control valves (size as indicated on drawings). Valves are to be constructed of a glass-filled nylon material with a self cleaning stainless steel screen. Low flow/low pressure operating capabilities. Flow: .25 to 200 GPM; Pressure: 20 to 200 PSI. Valves to conform to Manufacturer's Specifications concerning performance and at pressures provided.

B. Brass Body
Provide electric remote control valves (size as indicated on drawings). Valves are to be constructed with a brass body and bonnet assembly having a self cleaning screen. Flow and pressure operating capabilities. Flow: 5 to 200 GPM; Pressure: 20 to 200 PSI. Valves to conform to Manufacturer's Specifications concerning performance and at pressures provided.

C. All remote control valves shall be shall be installed with pressure regulation devices

B. Acceptable Manufacturers:

1. Manufacturer: Rainbird

a. Product (Plastic): PEB-PRS
b. Product (Brass): EFP-CP-PRS

2. Manufacturer: Toro

a. Product (Plastic): P-220-27
b. Product (Brass): 220-27

3. Manufacturer: Hunter

a. Product (Plastic): ICV-AS
b. Product (Brass): IBV-AS

2.12 SURGE PROTECTION EQUIPMENT

A. Provide lightning arrestor for controllers not equipped with primary surge protection. See notes in controller specification section related to specific controller grounding requirements.

2.13 ISOLATION VALVES

A. Provide all gate valves for isolation purposes, allowing full diameter opening when in full open position.

B. Manually operated valves: same size as line.

C. Valves 2" or smaller: Sch 80 PVC Ball Valves

D. Valves 3" or larger: cast iron fitted with rubber ring, slab-type gasket.

1. Acceptable Manufacturers:

c. Manufacturer: Clow

2.14 MISCELLANEOUS SYSTEM COMPONENTS

A. Provide risers, reducers, couplings, adapters, fittings as necessary to complete the irrigation system.

B. Irrigation contractor will be responsible to install any other irrigation components required by local codes and ordinances.

PART 3- EXECUTION

3.1 GENERAL

A. Inspect project site prior to start of Work to determine that all site conditions are acceptable for Irrigation Work to begin. Inform Owner of unsuitable conditions. Do not proceed with installation of irrigation system until unsatisfactory conditions have been corrected in a manner acceptable to installer.

B. Locate all existing underground utilities prior to trenching and/or boring operations. Obtain utility locations from Owner and/or CMR and utilize utility locating services when necessary.

3.2 EXCAVATION:

A. All excavation is unclassified and includes all materials encountered that are not classified as rock excavation.

B. Report exceptions to the Owner’s Representative before excavation. An adjustment in price will be established which includes removal and disposal of the unsuitable material, and the acquiring of additional backfill material.

C. Excavation in newly sodded areas: Prior to excavation, remove sod, preserve and replace after backfilling is completed.

D. Excavation in established grass or newly seeded areas: After excavation and backfilling is completed, re-grade trenched area consistent with surrounding area and re-seed with 100% pure seed of type grass existing. Mulch with straw and water.

E. Excavation through existing asphalt, cutting, removal and replacement of asphalt, as noted on the drawing, is the responsibility of the Irrigation Contractor.

F. Trenches for pipe sprinkler lines shall be excavated of sufficient depth and width to permit proper handling and installation by any other method the irrigation contractor may desire if approved by the Owner, pipe manufacturer, and Designer. The backfill shall be thoroughly compacted and evened off with the adjacent soil level. Selected fill dirt or sand shall be used if soil conditions are rocky. In rocky areas the trenching depth shall be two (2) inches below normal trenching depth to allow for this bedding. The fill dirt or sand shall be used in filling (4) inches above the pipe. The remainder of the backfill shall contain no lumps or rocks larger than three (3) inches. The top twelve (12) inches of backfill shall be topsoil, free of rocks, subsoil, or trash. Any open trenches or partially backfilled trenches left overnight or left unsupervised shall be barricaded to prevent undue hazard to the public.

G. The irrigation contractor shall backfill in six (6) inch compacted lifts as needed to bring the soil to its original density.

H. In the spring following the year of installation, the irrigation contractor shall repair any settlement of the trenches by bringing them to grade with topsoil, and seeding with the existing lawn type(s). Watering and maintenance of the repaired areas shall be the Owner's responsibility.

3.3 LEAKAGE TEST:

A. The system shall be subjected to a leakage test. Leakage shall be defined as the quantity of water that must be supplied into the pipe to maintain the design working pressure after all air in the pipeline has been expelled and the pipe has been filled with water. Leakage shall not exceed the quantity determined by the formula given below:

$$L = \frac{ND(\sqrt{P})}{3700}$$

Where **L** = allowable leakage in gallons per hour
N = number of joints in pipeline
D = nominal diameter of the pipe in inches
P = average test pressure during the leakage test in psig

If leakage exceed the allowable rate, leaks shall be found and repaired and the test repeated until successful.

3.4 BACKFILL:

A. Backfill material shall be free from rocks, large stones, and other unsuitable substance which could damage the pipe or create unusual settling problems. Backfill in 6" layers and tamp after each layer to prevent excessive settling.

B. Backfill trenches containing plastic pipe when pipe is cool to avoid excessive contraction in cold water. Such backfilling can be done in early morning hours or the pipe may be water cooled prior to backfilling procedures.

C. Minimum depth of cover of all pipe is a follows:

1. Lateral piping: 12” (unless local codes require deeper)

2. Mainline piping: 18” (unless local codes require deeper)

3.5 SLEEVING:

A. Location of sleeving shown on the drawings is schematic. GC to make adjustments necessary to accommodate existing vegetation, utilities and other existing conditions.

B. Repair of damage to existing utilities, structures or other construction resulting from installation of sleeves is the responsibility of the GC.

C. Irrigation sleeves shall be installed as per details. If sleeving horizontal depth exceeds the detailed requirement by (6”) 6 inches, it will be the responsibility of the GC to expose the horizontal ends below finish grade. In all areas where sleeving is not installed as per details the GC is to expose irrigation sleeves for Irrigation Contractor prior to start of the Irrigation Work

3.6 PIPE:

A. Pipe Joints:

1. Solvent Weld PVC Pipe: Assemble according to Manufacturer's Recommendations, using appropriate PVC pipe cleaner/primer and solvent cement.

B. Main Line: Install according to Manufacturer's Recommendations. Provide concrete thrust blocks at all directional changes on all pipe 2-1/2" and larger that is of the gasketed variety, as per drawings. Restraints to be utilized where required. Thrust Blocks and/or restraints shall be utilized where necessary in accordance with manufacturer’s specifications for pipe type, pipe size and local environmental conditions.

C. Pipes and Fittings:

1. Install according to manufacturer's Recommendations including snaking-in of PVC pipe to prevent excessive strain when contracting in cold weather.

D. Lateral Lines and Risers:

1. Install according to Manufacturer's Recommendations using standard techniques.

2. Combine lateral lines and main supply lines in common trenches wherever possible.

3. Install risers such that no excessive movement occurs while sprinkler head is in operation. Height of risers to be in accordance with planned and existing plant material. Height of all risers is subject approval of Landscape Architect.

4. Plug lines immediately upon installation to minimize infiltration of foreign matter.

5. Flush lateral lines and risers prior to installation of sprinkler heads.

6. Above ground risers must be dark gray or black in color.

3.7 SPRINKLER HEADS

A. Low Pop-up Sprinkler Heads: Install in such manner that top is 1" above finish grade. Where finish grade has not been established extend a riser minimum of 12" above existing grade to mark location of head. After finish grade is established install heads as shown on the drawings.

B. High Pop-Up Shrub Heads: Finish height to be determined by Landscape Architect.

C. Backfill around sprinkler head assembly in such manner as to stabilize the sprinkler head so that no lateral motion is exhibited during operation.

D. Sprinkler heads on risers: Install as shown on the drawings. High-pop sprinkler heads shall be installed in landscape areas to retract out of sight when non-operational. Height of all heads in bed areas to be determined in the field by the Landscape Architect.

E. Drip irrigation emitters are to be located in a manner that will provide optimum concentration of water to the plant material. Drip irrigation shall be installed in a grid pattern with manifolds to insure hydraulic balance.

3.8 ELECTRIC CONTROL WIRES

A. Install control wires in orderly fashion, locate in main line trench. Bundle wires together and tape at 10' intervals. Position wires to the right of the water supply line in the direction of the water flow.

B. Provide looped slack at directional changes in supply line to allow for contraction of wires.

C. Keep wire splices to a minimum and provide 10" round valve box at each splice location. Splices shall only occur at valve boxes.

D. Pass wires under existing or future paving and construction, through PVC sleeves.

E. For each open station on any given controller, there shall be spare wires to the furthest (2) two control valves located in diametricly opposed directions from the controller, plus one additional spare wire.

3.9 CONTROL EQUIPMENT:

A. Install automatic valves and controllers according to Manufacturer's Recommendation.

B. All remote-control valves to be installed with Sch 80 PVC ball valves in the same valve box upstream of the valves.

C. Leave twenty-four-inch loop of wire at each valve for expansion/contraction and servicing.

SECTION 32 84 00

IRRIGATION PERFORMANCE

3.10 VALVE BOXES:

A. All valves are to be housed in valve boxes. Install according to Manufacturer's Recommendations, and as shown on the drawings. Position boxes at a height that will not cause them to interfere with maintenance machinery (e.g., movers) and such that soil and mulch do not wash into the box. Locate valve box in mulched or natural areas one foot inside the bed line. Where no mulched areas or natural areas exist within forty feet of valve box locations install valve box in turf area. Install no more than two valve boxes together when installed in turf areas.

3.11 SURGE PROTECTION EQUIPMENT:

A. Install surge protection equipment on primary (110 VAC) power linesin accordance with the electrical grounding instructions included with each controller. Connect each surge protection unit to at least one 5/8" diameter by 9' long copper clad grounding electrode driven into the soil to its full depth. Place electrodes no closer than two (2) feet from the controller cabinet or any control or power wire. Be consistent in locating ground rods throughout the installation with respect to controller positions.

B. Ground wire between surge protection device and grounding electrode to be single strand bare copper wire at least one size greater than the wire supplying power to the control unit. Route ground wire away from power and control wires where possible. When it is necessary to pass through the controller cabinet wall use two (2) #L-70 copper grounding lugs and a brass bolt as noted on the drawings. Use a #WE 5/8 ground rod clamp (single piece and bolt) to make connection between ground rod and ground wire. Bury ground wire passing between controller and ground rod a minimum of ten inches. Cover the top of the rod and the clamp itself with a 4" round cover with lid at grade level.

3.12 BALANCING AND ADJUSTMENT:

A. Balance and adjust the various components of the sprinkler system so that the overall operation of the system is most efficient. This includes synchronization of the controllers, adjustments to pressure regulators, part circle sprinkler heads, and individual station adjustments on the controllers.

B. Upon completion of the irrigation system, perform a coverage test with the Owner's representative to determine if the irrigation coverage is adequate. Correct any inadequacies.

3.13 IRRIGATION DISTRIBUTION AND SPRINKLER OPERATION TESTING:

A. Upon completion of the irrigation system, and after head installation, test the entire system for proper operation. Flush all air from the system and check components for proper operation.

3.14 OWNER ORIENTATION:

A. Upon completion of the Work and at a time and place acceptable to the Landscape Architect and Owner, the Irrigation Contractor is responsible for the orientation of the Owner's maintenance personnel in the operation, maintenance, and repair of the system.

Furnish copies of all available parts lists, trouble shooting lists and specification sheets, to the Landscape Architect.

1. Operating and Maintenance Manuals shall constitute the basis of orientation.

B. Set the initial watering schedules and programming of the automatic controllers at direction of Landscape Contractor.

3.15 WINTERIZING THE SYSTEM:

A. The irrigation system shall be winterized the first winter season following Substantial Completion of the Project in total. The irrigation piping shall be winterized by first blowing the system clear of water using compressed air (80 psi maximum) admitted into the piping at a quick coupling valve or hose bib located at a higher elevation on the system piping. Activate individual zones, higher zones first, then proceed successively through the system towards lower elevations. Proceed through all zones twice. The air compressor must be sized to provide the volume requirements necessary to completely evacuate the irrigation piping system. The air compressor used to winterize the system must have an engine separate from the compressor tanks to prevent high temperature air from being injected directly into the PVC piping.

3.16 CLEAN UP AND PROTECTION:

A. During irrigation Work, keep Project Site clean and orderly.

B. Upon completion of Work, clear grounds of debris, superfluous materials and all equipment. Remove from site to the satisfaction of the Landscape Architect.

C. Protect Irrigation Work and materials from damage due to irrigation operations, operations by other contractor and trades and trespassers. Maintain protection until Date of Substantial Completion.

D. Cover all openings into the system as it is being installed to prevent obstructions in the pipe and the breakage, misuse or disfigurement of the equipment.

E. Theft: Irrigation Contractor is responsible for theft of equipment and material at the job site before, during and after installation, until Date of Substantial Completion of the Work in total.

END OF SECTION 32 84 00

SECTION 32 92 00

TURF AND GRASSES

SECTION 329200 - TURF AND GRASSES

1.1 SUMMARY

A. Sodded turf.

B. Native grasses and wildflowers.

1.2 QUALITY ASSURANCE

A. Installer's Personnel Certifications: Minimum of 3 years installation experience.

B. Soil analysis of each unamended soil type.

1.3 MAINTENANCE SERVICE

A. Sodded Turf: **60** days from date of **planting completion.**

B. Meadow: **60** days from date of **planting completion**.

1.4 MATERIALS

A. Turfgrass Sod: Bermuda Tif

B. Wildflower and Native Grass Seed: Native American Seed Mix – 70% Thunder Turf, 30% Native Texas Mix

C. Planting Soils: **ASTM D 5268 topsoil** amended with inorganic and organic soil amendments and fertilizers in specified quantities.

D. Mulches: Straw, sphagnum peat, compost

E. Erosion-Control Materials: **Blankets** or **Fiber mesh**.

1.5 INSTALLATION

A. Planting Soil Depth for Newly Graded Subgrades: **4 inches (100 mm)**.

B. Surface Soil Enrichment Depth for Unchanged Subgrades: **4 inches (100 mm)**

C. Seeding Method: Broadcast.

D. Protect seeded areas with [**straw mulch**] [**compost mulch**] [**peat mulch**]

END OF SECTION 329200

SECTION 32 93 00

PLANTS

SECTION 329300 - PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Plants.
2. Planting soils.
3. Tree stabilization.
4. Landscape edgings.

B. Related Sections:

1. Section 015639 "Temporary Tree and Plant Protection" for protecting, trimming, pruning, repairing, and replacing existing trees to remain that interfere with, or are affected by, execution of the Work.
2. Section 311000 "Site Clearing" for protection of existing trees and plantings, topsoil stripping and stockpiling, and site clearing.
3. Section 312000 "Earth Moving" for excavation, filling, and rough grading and for subsurface aggregate drainage and drainage backfill materials.
4. Section 329200 "Turf and Grasses" for turf (lawn) and meadow planting, hydroseeding, and erosion-control materials.
5. Section 334600 "Subdrainage" for below-grade drainage of landscaped areas, paved areas, and wall perimeters.

1.3 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with ball size not less than **diameter and depth recommended by ANSI Z60.1 for type and size of plant required**; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than **diameter and depth recommended by ANSI Z60.1 for type and size of plant required**.

D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1 for type and size of plant required.

E. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

F. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.

G. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.

H. Finish Grade: Elevation of finished surface of planting soil.

I. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

J. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

K. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

L. Planting Area: Areas to be planted.

M. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

N. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.

O. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

P. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.

Q. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

R. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

S. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, including soils.

1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
2. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to the Project.
3. Plant Photographs: Include color photographs in **digital** format of each required species and size of plant material as it will be furnished to the Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than **20** plants are required, include a minimum of **three** photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.

B. Samples for Verification: For each of the following:

1. **Compost** Mulch: **1-quart (1-liter)** volume of each mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
2. Mineral Mulch: **2 lb (1.0 kg)** of each mineral mulch required, in sealed plastic bags labeled with source of mulch. Sample shall be typical of the lot of material to be delivered and installed on the site; provide an accurate indication of color, texture, and makeup of the material.
3. Weed Control Barrier: 12 by 12 inches (300 by 300 mm).
4. Edging Materials and Accessories: Manufacturer's standard size, to verify color selected.
5. Root Barrier: Width of panel by 12 inches (300 mm).

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.

B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:

1. Manufacturer's certified analysis of standard products.
2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

C. Material Test Reports: For **standardized ASTM D 5268 topsoil**, **existing native surface topsoil**, **existing in-place surface soil and imported or manufactured topsoil**.

D. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before start of required maintenance periods.

E. Warranty: Sample of special warranty.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful establishment of plants.

1. Experience: **Three** years' experience in landscape installation in addition to requirements in Section 014000 "Quality Requirements."
2. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.

3. Pesticide Applicator: State licensed, commercial.

B. Soil-Testing Laboratory Qualifications: An independent or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of the soil.

1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
2. The soil-testing laboratory shall oversee soil sampling; with depth, location, and number of samples to be taken per instructions from Architect. A minimum of **three** representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
3. Report suitability of tested soil for plant growth.

    a. Based upon the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. (92.9 sq. m) or volume per cu. yd. (0.76 cu. m) for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
    b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.

D. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

E. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.

1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches (150 mm) above the root flare for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above the root flare for larger sizes.
2. Other Plants: Measure with stems, petioles, and foliage in their normal position.

F. Plant Material Observation: Landscape Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Landscape Architect retains right to observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Notify Landscape Architect of sources of planting materials **seven** days in advance of delivery to site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk fertilizers**,** lime**,** and soil amendments with appropriate certificates.

C. Deliver bare-root stock plants freshly dug. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.

D. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

E. Handle planting stock by root ball.

F. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F (16 to 18 deg C) until planting.

G. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1. Heel-in bare-root stock. Soak roots that are in dry condition in water for two hours. Reject dried-out plants.
2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
3. Do not remove container-grown stock from containers before time of planting.

4. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet condition.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. Interruption of Existing Services or Utilities: Do not interrupt services or utilities to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services or utilities according to requirements indicated:

1. Notify **Construction Manager** and **Owner** no fewer than **three days** in advance of proposed interruption of each service or utility.
2. Do not proceed with interruption of services or utilities without **Construction Manager's** and **Owner's** written permission.

C. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

1. Spring Planting: March 15 – May 15
2. Fall Planting: September 15 – December 15

D. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

E. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.

1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.9 WARRANTY

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.
b. Structural failures including plantings falling or blowing over.
c. Faulty performance of **tree stabilization**, **edgings**.
d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Periods from Date of **Planting Completion**:

   a. Trees, Shrubs, Vines, and Ornamental Grasses: **12** months.
   b. Ground Covers, Biennials, Perennials, and Other Plants: **12** months.

3. Include the following remedial actions as a minimum:

   a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
   b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
   c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.
   d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

1.10 MAINTENANCE SERVICE

A. Initial Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.

   1. Maintenance Period: **12** months from date of **planting completion**.

B. Initial Maintenance Service for Ground Cover and Other Plants: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.

   1. Maintenance Period: 12months from date of **planting completion**.

C. Continuing Maintenance Proposal: From Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

   1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing

trunks; cut-off limbs more than 3/4 inch (19 mm) in diameter; or with stem girdling roots will be rejected.

2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.

C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

D. If formal arrangements or consecutive order of plants is shown on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

2.2 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:

1. Class: T, with a minimum of 99 percent passing through No. 8 (2.36-mm) sieve and a minimum of 75 percent passing through No. 60 (0.25-mm) sieve.
2. Class: O, with a minimum of 95 percent passing through No. 8 (2.36-mm) sieve and a minimum of 55 percent passing through No. 60 (0.25-mm) sieve.
3. Provide lime in form of ground **dolomitic limestone** or **calcitic limestone**.

B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent sulfur, with a minimum of 99 percent passing through No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through No. 40 (0.425-mm) sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Aluminum Sulfate: Commercial grade, unadulterated.

E. Perlite: Horticultural perlite, soil amendment grade.

F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 (0.30-mm) sieve.

G. Sand: Clean, washed, natural or manufactured, and free of toxic materials.

H. Diatomaceous Earth: Calcined, 90 percent silica, with approximately 140 percent water absorption capacity by weight.

I. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.3 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through **1-inch (25-mm)**

sieve; soluble salt content of **5 to 10** decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: **50 to 60** percent of dry weight.
2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or granular texture, with a pH range of 3.4 to 4.8.

C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.

D. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.

E. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

2.4 FERTILIZERS

A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of **4** percent nitrogen and **20** percent phosphoric acid.

B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.

C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

E. Planting Tablets: Tightly compressed chip type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.

F.

1. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

G. Chelated Iron: Commercial-grade FeEDDHA for dicots and woody plants, and commercial-grade FeDTPA for ornamental grasses and monocots.

2.5 PLANTING SOILS

A. ASTM D 5268 topsoil, with pH range of 5.5 to 7, a minimum of **4** percent organic material content; free of stones **1/2** inch (25 mm) or larger in any dimension and other extraneous materials harmful to plant growth.

B. Existing, native surface topsoil formed under natural conditions with the duff layer retained during excavation process **and stockpiled on-site**. Verify suitability of native surface topsoil to produce viable planting soil. Clean soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

C. Existing, in-place surface soil. Verify suitability of existing surface soil to produce viable planting soil. Remove stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.

D. Imported topsoil or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from**agricultural land,** bogs, or marshes.

1. Additional Properties of Imported Topsoil or Manufactured Topsoil: Screened and free of stones 1 inch (25 mm) or larger in any dimension; free of roots, plants, sod, clods, clay lumps, pockets of coarse sand, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials harmful to plant growth; free of obnoxious weeds and invasive plants including quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and bromegrass; not infested with nematodes; grubs; or other pests, pest eggs, or other undesirable organisms and disease-causing plant pathogens; friable and with sufficient structure to give good tilth and aeration. Continuous, air-filled pore space content on a volume/volume basis shall be at least 15 percent when moisture is present at field capacity. Soil shall have a field capacity of at least 15 percent on a dry weight basis.

2.6 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1. Type: **Bark Mulch**
2. Size Range: **3 inches (76 mm) maximum, 1/2 inch (13 mm) minimum**
3. Color: Natural.

B. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch (25-mm) sieve; soluble salt content of **2 to 5** decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: **50 to 60** percent of dry weight.
2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

C. Mineral Mulch: Hard, durable stone, washed free of loam, sand, clay, and other foreign substances, of following type, size range, and color:

1. Type: Rounded riverbed gravel or smooth-faced stone.
2. Size Range: 1-3 inches
3. Color: Readily available natural gravel color range to be selected by Architect and Owner

2.7 WEED-CONTROL BARRIERS

A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. (101g/sq. m) minimum, composed of fibers formed into a stable network so that fibers retain their relative position. Fabric shall be inert to biological degradation and resist naturally-encountered chemicals, alkalis, and acids.

2.8 PESTICIDES

A. General: Pesticide registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.9 TREE STABILIZATION MATERIALS

A. Stakes and Guys:

1. Upright and Guy Stakes: Rough-sawn, sound, new **hardwood** or **softwood with specified wood pressure-preservative treatment**, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal (38-by-38-mm actual) by length indicated, pointed at one end.
2. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes or **turnbuckles**.
3. Guys and Tie Wires: ASTM A 641/A 641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch (2.7 mm) in diameter.
4. Tree-Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.
5. Guy Cables: Five-strand, 3/16-inch- (4.8-mm-) diameter, galvanized-steel cable, with zinc-coated **turnbuckles** a minimum of 3 inches (75 mm) long, with two 3/8-inch (10-mm) galvanized eyebolts.
6. Flags: Standard surveyor's plastic flagging tape, white, 6 inches (150 mm) long.

7. Proprietary Staking-and-Guying Devices: Proprietary stake and adjustable tie systems to secure each new planting by plant stem; sized as indicated and per manufacturer's written recommendations.

   a. Products: Subject to compliance with requirements, **available products that may be incorporated into the Work include, but are not limited to, the following**:

      1) Arborbrace; ArborBrace Tree Guying System.
      2) Decorations for Generations, Inc.; **Reddy Stake**, **Mega Stake** System.

2.10 LANDSCAPE EDGINGS

A. Steel Edging: Standard commercial-steel edging, rolled edge, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes.

1. Manufacturers: Subject to compliance with requirements, **available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**:

   a. Border Concepts, Inc.
   b. Collier Metal Specialties, Inc.
   c. Russell, J. D. Company (The).
   d. Sure-Loc Edging Corporation.

2. Edging Size: **1/4 inch (6.4 mm) wide by 4 inches (100 mm) deep**
3. Stakes: Tapered steel, a minimum of **12 inches (300 mm)** long.
4. Accessories: Standard tapered ends, corners, and splicers.
5. Finish: **Standard paint**.
6. Paint Color: **Black**.

2.11 MISCELLANEOUS PRODUCTS

A. Wood Pressure-Preservative Treatment: AWPA C2, with waterborne preservative for soil and freshwater use, acceptable to authorities having jurisdiction, and containing no arsenic; including ammoniacal copper arsenate, ammoniacal copper zinc arsenate, and chromated copper arsenate.

B. Root Barrier: Black, molded, modular panels manufactured with 50 percent recycled polyethylene plastic with ultraviolet inhibitors, 85 mils (2.2 mm) thick, with vertical root deflecting ribs protruding 3/4 inch (19 mm) out from panel, and each panel **24 inches (610 mm)**.

C. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.

D. Burlap: Non-synthetic, biodegradable.

E. Planter Drainage Gravel: Washed, sound crushed stone or gravel complying with **ASTM D 448 for Size No. 8**

F. Planter Filter Fabric: **Nonwoven** geotextile manufactured for separation applications and made of polypropylene, polyolefin, or polyester fibers or combination of them.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

D. Lay out plants at locations directed by Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

E. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

F. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

3.3 PLANTING AREA ESTABLISHMENT

A. Loosen subgrade of planting areas to a minimum depth of **6 inches (150 mm)**. Remove stones larger than **1 inch (25 mm)** in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Apply fertilizer directly to subgrade before loosening.
2. **Thoroughly blend planting soil off-site before spreading**.

a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
b. Mix lime with dry soil before mixing fertilizer.

3. Spread planting soil to a depth of **6 inches (150 mm)** but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

a. Spread approximately one-half the thickness of planting soil over loosened subgrade. Mix thoroughly into top **3 inches** of subgrade. Spread remainder of planting soil.

B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.4 EXCAVATION FOR TREES AND SHRUBS

A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.

1. Excavate approximately three times as wide as ball diameter.
2. Excavate deep enough to accommodate vertical roots for bare-root stock.
3. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
4. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
5. Maintain required angles of repose of adjacent materials as shown on the Drawings. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
6. Maintain supervision of excavations during working hours.
7. Keep excavations covered or otherwise protected **after working hours**.
8. If drain tile is shown on Drawings or required under planting areas, excavate to top of porous backfill over tile.

B. Subsoil and topsoil removed from excavations **may not** be used as planting soil.

C. Obstructions: Notify Landscape Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

1. Hardpan Layer: Drill 6-inch- (150-mm-) diameter holes, 24 inches (600 mm) apart, into free-draining strata or to a depth of 10 feet (3 m), whichever is less, and backfill with free-draining material.

D. Drainage: Notify Landscape Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE, SHRUB, AND VINE PLANTING

A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.

B. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

C. Set balled and burlapped stock plumb and in center of planting pit or trench with root flare 3” above adjacent finish grades.

1. Use planting soil for backfill.
2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.
5. Continue backfilling process. Water again after placing and tamping final layer of soil.

D. Set **container-grown** stock plumb and in center of planting pit or trench with root flare 3“ above adjacent finish grades.

1. Use planting soil for backfill.
2. Carefully remove root ball from container without damaging root ball or plant.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.
5. Continue backfilling process. Water again after placing and tamping final layer of soil.

E. Set fabric bag-grown stock plumb and in center of planting pit or trench with root flare 3” above adjacent finish grades.

1. Use planting soil for backfill.
2. Carefully remove root ball from fabric bag without damaging root ball or plant. Do not use planting stock if root ball is cracked or broken before or during planting operation.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.
5. Continue backfilling process. Water again after placing and tamping final layer of soil.

F. Set and support bare-root stock in center of planting pit or trench with root flare **1 inch (25 mm) above** adjacent finish grade.

1. Use planting soil for backfill.
2. Spread roots without tangling or turning toward surface, and carefully work backfill around roots by hand. Puddle with water until backfill layers are completely saturated. Plumb before backfilling, and maintain plumb while working backfill around roots and placing layers above roots.
3. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside soil-covered roots about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole or touching the roots.
4. Continue backfilling process. Water again after placing and tamping final layer of soil.

G. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.6 MECHANIZED TREE SPADE PLANTING

A. Trees **may** be planted with an approved mechanized tree spade at the designated locations. Do not use tree spade to move trees larger than the maximum size allowed for a similar field-grown, balled-and-burlapped root-ball diameter according to ANSI Z60.1, or larger than the manufacturer's maximum size recommendation for the tree spade being used, whichever is smaller.

B. When extracting the tree, center the trunk within the tree spade and move tree with a solid ball of earth.

C. Cut exposed roots cleanly during transplanting operations.

D. Use the same tree spade to excavate the planting hole as was used to extract and transport the tree.

E. Plant trees as shown on Drawings, following procedures in "Tree, Shrub, and Vine Planting" Article.

F. Where possible, orient the tree in the same direction as in its original location.

3.7 TREE, SHRUB, AND VINE PRUNING

A. Remove only dead, dying, or broken branches. Do not prune for shape.

B. Prune, thin, and shape trees, shrubs, and vines as directed by Architect.

C. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.

D. Do not apply pruning paint to wounds.

3.8 TREE STABILIZATION

A. Install trunk stabilization as follows unless otherwise indicated:

1. Upright Staking and Tying: Stake trees of less than 2-inch (50-mm) caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18 inches (450 mm) below bottom of backfilled excavation and to extend **one-third of trunk height**] above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.
2. Use two stakes for trees up to 12 feet (3.6 m) high and 2-1/2 inches (63 mm) or less in caliper; three stakes for trees less than 14 feet (4.2 m) high and up to 4 inches (100 mm) in caliper. Space stakes equally around trees.
3. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
4. Support trees with two strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

B. Staking and Guying: Stake and guy trees more than 14 feet (4.2 m) in height and more than 3 inches (75 mm) in caliper unless otherwise indicated. Securely attach no fewer than three guys to stakes 30 inches (760 mm) long, driven to grade.

1. Site-Fabricated Staking-and-Guying Method:

a. For trees more than 6 inches (150 mm) in caliper, anchor guys to wood deadmen buried at least 36 inches (900 mm) below grade. Provide **turnbuckle** for each guy wire and tighten securely.
b. Support trees with bands of flexible ties at contact points with tree trunk and reaching to **turnbuckle**. Allow enough slack to avoid rigid restraint of tree.
c. Support trees with strands of cable or multiple strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk and reaching to **turnbuckle**. Allow enough slack to avoid rigid restraint of tree.
d. Attach flags to each guy wire, 30 inches (760 mm) above finish grade.
e. Paint **turnbuckles** with luminescent white paint.

2. Proprietary Staking and Guying Device: Install staking and guying system sized and positioned as recommended by manufacturer unless otherwise indicated and according to manufacturer's written instructions.

3.9 PLANTING IN PLANTERS

A. Place a layer of drainage gravel at least 4 inches (100 mm) thick in bottom of planter. Cover bottom with filter fabric and wrap filter fabric **4 inches (100 mm)** on all sides. Duct tape along the entire top edge of the filter fabric, to secure the filter fabric against the sides during the soil-filling process.

3.10 GROUND COVER AND PLANT PLANTING

A. Set out and space ground cover and plants other than trees, shrubs, and vines **as indicated** in even rows with triangular spacing.

B. Use planting soil for backfill.

C. Dig holes large enough to allow spreading of roots.

D. For rooted cutting plants supplied in flats, plant each in a manner that will minimally disturb the root system but to a depth not less than two nodes.

E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.11 PLANTING AREA MULCHING

A. Install weed-control barriers before mulching according to manufacturer's written instructions. Completely cover area to be mulched, overlapping edges a minimum of **12 inches (300mm)** and secure seams with galvanized pins.

B. Mulch backfilled surfaces of planting areas and other areas indicated.

1. Trees **and Tree-like Shrubs** in Turf Areas: Apply [**organic**] [**mineral**] mulch ring of **2- 3-inch (75-mm)** average thickness, with **36-inch (900-mm)** radius around trunks or stems. Do not place mulch within **3 inches (75 mm)** of trunks or stems.
2. Organic Mulch in Planting Areas: Apply **3-inch (75-mm)** average thickness of organic mulch **over whole surface of planting area**.
3. Mineral Mulch in Planting Areas: Apply **3-inch (75-mm)**] <**Insert dimension**> average thickness of mineral mulch **over whole surface of planting area**], and finish level with adjacent finish grades.

3.12 EDGING INSTALLATION

A. Steel Edging: Install steel edging where indicated according to manufacturer's written instructions. Anchor with steel stakes spaced approximately 30 inches (760 mm) apart, driven below top elevation of edging.

3.13 PLANT MAINTENANCE

A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.

B. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated past management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.14 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Pre-Emergent Herbicides (Selective and Non-Selective): Apply to tree, shrub, and ground-cover areas in accordance with manufacturer's written recommendations. Do not apply to seeded areas.

C. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.15 CLEANUP AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.

B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

C. After installation and before [**Substantial Completion**] <**Insert time**>, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

3.16 DISPOSAL

A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 329300

SECTION 21 10 13 – WET PIPE SPRINKLER SYSTEM

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

B. Shop Drawings:
   1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
   2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components, and accessories. Indicate system controls.
   3. Submit shop drawings to Authorities Having Jurisdiction for approval. Submit proof of approval to Architect.

C. Designer's qualification statement.

D. Manufacturer's qualification statement.

E. Installer's qualification statement.

F. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

1.02 QUALITY ASSURANCE

A. Comply with FM (AG) requirements.

B. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

PART 2 PRODUCTS

2.01 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for entire building.

B. Occupancy: Light hazard; comply with NFPA 13.

C. Water Supply: Determine volume and pressure from water flow test data.

D. Interface system with building fire and smoke alarm system.

E. Provide fire department connections where indicated.

F. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

G. Pipe Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:

2.02 SPRINKLERS

A. Suspended Ceiling Type: Concealed pendant type with matching push on cover plate.
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Cover Plate Finish: Match ceiling color.
   4. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

B. Exposed Area Type: Pendant type with guard.
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

C. Sidewall Type: Semi-recessed horizontal sidewall type with matching push on escutcheon plate.

1. Response Type: Quick.
2. Coverage Type: Standard.
3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

2.03 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
   1. Activate electric alarm.
   2. Test and drain valve.
   3. Replaceable internal components without removing valve from installed position.

B. Backflow Preventer: Double check valve assembly backflow preventer with drain and OS & Y gate valve on each end.

C. Test Connections:
   1. Backflow Preventer Test Connection:
      a. Provide downstream of the backflow prevention assembly, listed hose valves with 2.5 inch (65 mm) National Standard male hose threads with cap and chain.
      b. Provide permanent sign reading "Test Valve" in accordance with Section 210553.

D. Water Motor Alarm: Hydraulically operated impeller type alarm with aluminum alloy chrome plated gong and motor housing, nylon bearings, and inlet strainer.

E. Fire Department Connections:
   1. Type: Flush, wall mount made of corrosion resistant metal complying with UL 405.
      a. Inlets: Two way, 2-1/2 inch (65 DN) swivel fittings, internal threaded. Thread size and inlets according to NFPA 1963 or Authority Having Jurisdiction. Brass caps with gaskets, chains, and lugs.
      b. Configuration: Horizontal.
      c. Rated Working Pressure: 175 psi (1200 kPa).
      d. Finish: Per Architect..
      e. Signage: Raised or engraved lettering 1 inch (25.4 mm) minimum indicating system type.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

B. Install equipment in accordance with manufacturer's instructions.

C. Flush entire piping system of foreign matter.

D. Hydrostatically test entire system.

E. Require test be witnessed by Fire Marshal.

END OF SECTION

SECTION 220500 - BASIC MECHANICAL, PLUMBING & FIRE PROCTECTION REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. Basic and supplemental requirements common to Mechanical Work.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the Contract Documents.

1.04 DEFINITIONS

A. These definitions are included to clarify the direction and intention of these Specifications. For further clarification, contact the Architect/Engineer.

1. Concealed / Exposed: "Concealed" areas are those areas that cannot be seen by the building occupants. "Exposed" areas are all areas, which are exposed to view by the building occupants, including under counters, inside cabinets and closets, plus all mechanical rooms. “Exterior” areas are those that are outside the building exterior envelope and exposed to the outdoors.

2. Furnish: The term "furnish" is used to mean "supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations.

3. Install: The term "install" is used to describe operations at Project Site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

4. Provide: The term "provide" means "to furnish and install, complete and ready for the intended use.

1.05 QUALITY ASSURANCE

A. Mechanical, Plumbing and Fire Suppression Systems shall be coordinated with other systems and trades to include but not be limited to: Electrical systems, fire alarm, security systems, transport systems, telephone and data systems.

B. Verification of Dimensions: The Contractor shall be responsible for the coordination and proper relation of Contractor's Work to the building structure and to the Work of all trades. The Contractor shall visit the premises and become thoroughly familiar with all details of the Work and working conditions, to verify all dimensions in the field, and to advise the Architect/Engineer of any discrepancy before performing any Work. Adjustments to the Work required in order to facilitate a coordinated installation shall be made at no additional cost to the Owner or the Architect/Engineer.

C. All dimensional information related to new structures shall be taken from the appropriate Drawings. All dimensional information related to existing facilities shall be taken from actual measurements made by the Contractor on the Site.

D. The Drawings are subject to the requirements of Reference Standards, structural and architectural conditions. The Contractor shall carefully investigate structural and finish conditions and shall coordinate the separate trades in order to avoid interference between the various phases of Work. Work shall be organized and laid out so that it will be concealed in furred chases and suspended ceilings, etc., in finished portions of the building, unless specifically noted to be exposed. All exposed Work shall be installed parallel or perpendicular to the lines of the building unless otherwise noted.

E. When the Drawings do not give exact details as to the elevation of pipe and ducts, the Contractor shall physically arrange the systems to fit in the space available at the elevations intended with proper grades for the functioning of the system involved. Piping and duct systems are generally intended to be installed true and square to the building construction, and located as high as possible against the structure in a neat and workmanlike manner. The Drawings do not show all required offsets, control lines, pilot lines and other location details. Work shall be concealed in all finished areas.

F. Where core drilling of floor or wall penetrations is required, Work shall be performed in accordance with Division 03 Specifications. Where applicable Division 03 Specifications are not included in the Project, core drilling shall be in accordance with generally accepted standards, and be performed by licensed personnel where applicable.

G. Certify in writing that neither the Contractor nor any of Contractor's subcontractors or suppliers will supply any materials that contain any asbestos in any form for this Project.

1.06 LEED AND SUSTAINABILITY

A. Product Data for Credit IEQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content.

B. Laboratory Test Reports for Credit IEQ 4: For adhesives and sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Submit MSDS sheets showing compliance with Section 01 81 13 – Sustainable Design Requirements.

D. Sealants shall meet the requirements of SCAQMD r1168 and CDPH v1.1-2010 for emissions

E. Paints shall meet the requirements of SCAQMD r1113 for coatings and CDPH v1.1-2010 for emissions.

1.07 SEQUENCING AND SCHEDULING

A. Coordinate equipment installation with other building components.

B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.

E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

F. Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in Section 08 31 13 - "Access Doors and Frames."

G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment

1.08 DELIVERY, STORAGE AND HANDLING

A. All equipment, ductwork, and materials shall be delivered to the Project Site clean and sealed for protection.

B. Take particular care not to damage the existing construction in performing Work. All finished floors, step treads and finished surfaces shall be covered to prevent any damage by workers or their tools and equipment during the construction of the Project.

C. Equipment and materials shall be protected from rust and dust/debris both before and after installation. Any equipment or materials found in a rusty condition at the time of final inspection must be cleaned of rust and repainted as specified elsewhere in these Specifications.

D. All material affected by weather shall be covered and protected to keep the material free from damage while material is being transported to the Site and while stored at the Project Site.

E. During the execution of the Work, open ends of all piping and conduit, and all openings in equipment shall be closed when Work is not in progress, and shall be capped and sealed prior to completion of final connections, so as to prevent the entrance of foreign matter.

F. All equipment shall be protected during the execution of the Work. All ductwork and equipment shall be sealed with heavy plastic and tape to prevent build-up of dust and debris.

G. All ductwork and air handling equipment shall be wiped down with a damp cloth immediately before installation to ensure complete removal of accumulated dusts and foreign matter.

H. All plumbing fixtures shall be protected and covered to prohibit usage. All drains shall be covered until placed in service to prevent the entrance of foreign matter. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture.

I. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.

J. Protect flanges, fittings, and piping specialties from moisture and dirt.

K. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. All equipment installed shall have local representation, local factory authorized service, and a local stock of repair parts.

C. Responsibility for furnishing proper equipment and/or material and ensuring that equipment and/or material is installed as intended by the manufacturer, rests entirely upon the Contractor. Contractor shall request advice and supervisory assistance from the representative of specific manufacturers during the installation.

D. All materials, unless otherwise specified, shall be new, free from all defects, suitable for the intended use and of the best quality of their respective kinds. Materials and equipment shall be installed in accordance with the manufacturer's recommendations and the best standard practice for the type of Work involved. All Work shall be executed by mechanics skilled in their respective trades, and the installations shall provide a neat, precise appearance. Materials and/or equipment damaged in shipment or otherwise damaged prior to installation shall not be repaired at the job Site but shall be replaced with new materials and/or equipment.

E. Materials and equipment manufactured domestically are preferred when possible. Materials and equipment that are not available from a domestic manufacturer may be by a non-domestic manufacturer provided they fully comply with Contract Documents.

F. Prevention of Rust: Standard factory finish will be acceptable on equipment specified by model number; otherwise, surfaces of ferrous metal shall be given a rust inhibiting coating.

2.02 NAMEPLATES

A. Each major component of equipment shall have the manufacturer's name, address, and catalog number on a plate securely attached to the item of equipment. All data on nameplates shall be legible at the time of Final Inspection.

B. Nameplates shall be black laminated rigid phenolic with white core. Nameplate minimum size shall be 1 inch high by 3 inches long with 3/16-inch-high engraved white letters.

C. Nameplate Fasteners: Fasten nameplates to the front of equipment only by means of stainless steel self-tapping screws. Stick-ons or adhesives will not be allowed unless the NEMA enclosure rating is compromised, then only epoxy adhesive shall be used to attach nameplates.

D. Nameplate Information: In general, the following information is to be provided for the types of electrical components or enclosures supplied with equipment.

1. Individual Starters, Contactors, Disconnect Switches, and Similar Equipment: Identify the device, and voltage characteristics source and load served.

2.03 WALL, FLOOR AND CEILING PLATES (ESCUTCHEONS)

A. Except as otherwise noted, provide stainless steel or chrome plated brass floor and ceiling plates around all pipes, ducts, conduits, etc., passing exposed through walls, floors or ceilings, in any spaces except underfloor and plenum spaces.

B. Plates shall be sized to fit snugly against the outside of the pipe or against the insulation on lines that are insulated and positively secured to such pipe or insulation.

C. For finished ceiling installation, secure escutcheons to ceiling with escutcheon fasteners.

D. Plates will not be required for piping where pipe sleeves extend ¾-inch or more above finished floor.

E. Round and rectangular ducts shall have closure plates (not chrome plated) made to fit accurately at all floor, wall and ceiling penetrations.

2.04 ROOF PENETRATIONS AND FLASHING

A. Pipe, conduit and duct sleeves, pitch pockets and flashings compatible with the roofing installation shall be provided and installed for all roof penetrations by a contractor qualified in such Work. Installation shall comply with the Contract Documents and with FM General Data Sheets 1-28, 1-29, 1-31 & 1-49 along with the FM approval guide.

PART 3 - EXECUTION

3.01 PREPARATION

A. Cooperate with trades of adjacent, related or affected materials or operations, and with trades performing continuations of this Work in order to effect timely and accurate placing of Work and to coordinate, in proper and correct sequence, the Work of such trades.

B. The size of equipment indicated on the Drawings is based on the dimensions of a particular manufacturer. While other manufacturers may be acceptable, it is the responsibility of the Contractor to determine that the equipment proposed will fit in the space. Fabrication Drawings shall be prepared when required by the Architect/Engineer or Owner to indicate a suitable arrangement.

C. All equipment shall be installed in a manner to permit access to all surfaces. All valves, motors, drives, filters, and other accessory items shall be installed in a position to allow removal for service without disassembly of another part.

D. Space Requirements:

1. Consider space limitations imposed by contiguous Work in location of equipment and material. Do not provide equipment or material which is not suitable in this respect.

2. Make changes in material and equipment locations of up to five (5) feet, to allow for field conditions prior to actual installation, and as directed by the Architect/Engineer at no additional cost to the Owner.

E. Contractor shall note that the electrical design and Drawings are based on the equipment scheduled and indicated on the Drawings. Should any equipment be provided requiring changes to the electrical design, the required electrical changes shall be made at no cost to the Owner.

F. Connections for equipment other than Divisions 21, 22, 23:

1. Rough-in and provide all gas, air, water, steam, sewer, etc. connections to all fixtures, equipment, machinery, etc., furnished by the Owner and/or other trades in accordance with detailed rough-in Drawings provided by the equipment suppliers, by actual measurements of the equipment connections, or as detailed.

2. After the equipment is set in place, make all final connections and provide all required pipe, fittings, valves, traps, etc.

3. Provide all backflow preventers and air gap fittings required, using approved devices. In each service line connected to an item of equipment or piece of machinery, provide a shutoff valve. On each drain not provided with a trap, provide a suitable trap.

4. Provide all ductwork, transition pieces, etc., required for a complete installation of vent hoods, etc.

3.02 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer’s published recommendations.

C. Piping may be run exposed in rooms typically without ceilings such as mechanical rooms, janitor's closets, tight against pan soffits in exposed "tee" structures, or storage spaces, but only where necessary. Shutoff and isolation valves shall be easily accessible.

D. All pipe, conduits, etc., shall be cut accurately to measurements established at the building and shall be worked into place without springing or forcing. All ducts, pipes and conduits run exposed in machinery and equipment rooms shall be installed parallel to the building lines, except that piping shall be sloped to obtain the proper pitch. Piping and ducts run in furred ceilings, etc., shall be similarly installed, except as otherwise shown. All pipe openings shall be kept closed until the systems are closed with final connections.

E. Prior to the installation of any ceiling material, gypsum, plaster or acoustical board, the Contractor shall notify Owner’s Project Manager so that arrangement can be made for an inspection of the above-ceiling area about to be "sealed" off. The Contractor shall provide written notification to the Owner at least five (5) calendar days prior to the inspection.

F. Precedence of Materials:

1. The Specifications determine the nature and setting of materials and equipment. The Drawings establish quantities, dimensions and details.

2. If interference is encountered, the following installation precedence of materials shall guide the Contractor to determine which trade shall be given the "Right of Way":

   a. Building lines

   b. Structural members

   c. Structural support frames supporting ceiling equipment

   d. Soil and drain piping

   e. Vent piping

   f. Supply, return and outside air ductwork

   g. Exhaust ductwork

h. Condensate piping

i. Fire protection piping

j. Natural gas piping

k. Domestic water (cold and hot, softened, treated)

l. Refrigerant piping

m. Electrical conduit

3. Coordinate fire suppression, plumbing and HVAC systems with transport systems as required to maintain transport system right-of-way.

3.03 TESTING

A. When any piece of mechanical equipment is operable and it is to the advantage of the Contractor to operate the equipment, Contractor may do so, provided that Contractor properly supervises the operation, and has the Owner's written permission to do so. The warranty period shall, however, not commence until such time as the equipment is operated for the beneficial use of the Owner, or date of Substantial Completion, whichever occurs first.

B. Regardless of whether or not the equipment has or has not been operated, the Contractor shall properly clean the equipment, install clean filter media, properly adjust, and complete all deficiency list items before final acceptance by the Owner. The date of acceptance and performance certification will be the same date.

C. Before the Work is accepted, an authorized representative of the manufacturer of the installed materials and/or equipment shall personally inspect the installation and operation of manufacturer's materials and/or equipment to determine that materials and/or equipment are properly installed and in proper operating order. The qualifications of the manufacturer's representative shall be appropriate to the technical requirements of the installation. The qualifications of the manufacturer's representative shall be submitted to the Owner for approval. The decision of the Owner concerning the appropriateness of the manufacturer's representative shall be final. Testing and checking shall be accomplished during the course of the Work where required by Work being concealed, and at the completion of the Work. In addition, the Contractor shall submit to the Architect/Engineer a signed statement from each manufacturer's representative certifying as follows: **"I certify that the materials and/or equipment listed below have been personally inspected by the undersigned authorized manufacturer's representative and is properly installed and operating in accordance with the manufacturer's recommendations."**

D. Check inspections shall include piping, equipment, heating, air conditioning, insulation, ventilating equipment, controls, mechanical equipment and such other items hereinafter specified or specifically designated by the Architect/Engineer.

E. The Contractor shall execute, at no additional cost to the Owner, any tests required by the city, state, authority having local jurisdiction or Owner or the National Fire Protection Association, ASTM, etc. Standards listed. The Contractor shall provide all equipment, materials and labor for making such tests.

F. Notify the Owner's Project Manager and the Architect/Engineer in writing at least seven (7) calendar days prior to each test and prior to other Specification requirements requiring Owner and Architect/Engineer to observe and/or approve tests.

G. All tests shall have pertinent data logged by the Contractor at the time of testing. Data shall include date, time, personnel performing, observing and inspecting, description of the test and extent of system tested, test conditions, test results, specified results an other pertinent data. Data shall be delivered to the Architect/Engineer as specified under "Requirements for Final Acceptance." The Contractor or Contractor's authorized job superintendent shall legibly sign all Test Log entries.

3.04 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General: Install piping as described below, unless piping Sections specifies otherwise. Individual Division 22 and 23 piping Sections specifies unique piping installation requirements.

B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings as required by Division 01 Sections and as outlined in Part 1 of this section.

C. Install piping at indicated slope.

D. Install components with pressure rating equal to or greater than system operating pressure.

E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.

F. Install piping free of sags and bends.

G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

I. Install piping to allow application of insulation plus 1-inch clearance around insulation.

J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

K. Install fittings for changes in direction and branch connections.

L. Install couplings according to manufacturer's written instructions.

M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:

1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish.

2. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.

3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.

4. Insulated Piping: Cast brass with concealed hinge, set screws, and chrome-plated finish.

5. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.

N. Install sleeves for pipes passing through concrete and masonry walls, and concrete floor and roof slabs.

1. 1. Cut sleeves to length for mounting flush with both surfaces.

    a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping rings where required.

2. Build sleeves into walls and slabs as work progresses.

3. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

    a. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS (DN150).

    b. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS (DN150) and larger, penetrating gypsum-board partitions.

4. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.

    a. Seal space outside of sleeve fittings with non-shrink, nonmetallic grout.

5. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealant. Refer to Section 07 92 00 "Joint Sealants" for materials.

6. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.

O. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.

2. Install cast-iron "wall pipes" for sleeves 6 inches in diameter and larger.

3. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

P. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

Q. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire stopping materials.

R. Verify final equipment locations for roughing-in.

S. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

T. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:

1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

3. Soldered Joints: Construct joints according to CDA's "Copper Tube Handbook."

4. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

5. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

    a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.

    b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.

    c. Align threads at point of assembly.

    d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.

    e. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

6. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators according to "Quality Assurance" Article.

7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.

8. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following:

    a. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.

    b. CPVC Piping: ASTM D2846 and ASTM F493.

    c. PVC Pressure Piping: ASTM D2672.

    d. PVC Non-pressure Piping: ASTM D2855.

9. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D2657 procedures and manufacturer's written instructions.

    a. Plain-End Pipe and Fittings: Use butt fusion.

    b. Plain-End Pipe and Socket Fittings: Use socket fusion.

U. Piping Connections: Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping 2-inch NPS (DN50) and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS (DN50) or smaller threaded pipe connection.

2. Install flanges, in piping 2-1/2-inch NPS (DN65) and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.

3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.

4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.05 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to provide maximum possible headroom, if mounting heights is not indicated.

B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Owner's Representative.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

D. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

E. Install equipment giving right of way to piping installed at required slope as specified in other Division 22 sections.

F. Clearance from Electrical Equipment: Piping is prohibited in electric rooms and closets, elevator machine rooms and installation over transformers, switchboards and motor control centers.

3.06 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psig 28-day compressive-strength concrete and reinforcement as specified in Section 03 30 00 - "Cast-in-Place Concrete."

3.07 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

C. Prime and paint all metal supports.

3.08 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage to support and anchor mechanical materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.09 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair cut surfaces to match adjacent surfaces.

C. Refer to Division 01 Sections for additional requirements.

3.10 GROUTING

A. Install nonmetallic, non-shrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's written instructions.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placing of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases to provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout according to manufacturer's written instructions.

3.11 TRAINING

A. Operating and Maintenance Manuals and instruction shall be provided as specified under the Division 01 Section entitled “Project Closeout Procedures.”

B. Specific training and operating instructions for individual equipment components shall be as specified in the individual Specification Sections.

C. All equipment, piping, conduit, ductwork, grilles, insulation, etc., furnished and installed in exposed areas shall be cleaned, prepared and painted as specified in Division 09.

END OF SECTION

SECTION 22 05 29 - MECHANICAL, PLUMBING & FIRE PROTECTION SUPPORTS AND SLEEVES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. Perform all Work required to provide and install supports, hangers, anchors, sleeves and bases for all pipe, duct, equipment, system components and accessories, indicated by the Contract Documents with all supplementary items necessary for complete, code compliant and approved installation

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and Workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. International Mechanical Code.
2. International Plumbing Code.
3. International Fuel Gas Code.
4. ASME B31.2 - Fuel Gas Piping.
5. ASME B31.9 - Building Services Piping.
6. ASTM F708 - Design and Installation of Rigid Pipe Hangers.
7. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
8. MSS SP69 - Pipe Hangers and Supports - Selection and Application.
9. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
10. MSS SP-90 - Guidelines on Terminology for Pipe Hangers and Supports.
11. NFPA 13 - Installation of Sprinkler Systems.
12. NFPA 14 - Installation of Standpipe and Hose Systems.
13. UL 203 - Pipe Hanger Equipment for Fire Protection Service.
14. SMACNA - HVAC Duct Construction Standards.
15. Underwriters Laboratories Standards and Listings.

1.04 QUALITY ASSURANCE

A. Materials and application of pipe hangers and supports shall be in accordance with MSS-SP-58 and SP-69 unless noted otherwise.

B. Support and sleeve materials and installation shall not interfere with the proper functioning of equipment.

C. Contractor shall be responsible for structural integrity of all hangers, supports, anchors, guides, inserts and sleeves. All structural hanging materials shall have a minimum safety factor of five.

D. Installer Qualifications: Utilize an installer experienced in performing Work of this Section who is experienced in installation of Work similar to that required for this Project and per the minimum requirements of MSS SP-89. Field welding of supports shall be by certified welders qualified in accordance with ASME Boiler and Pressure Vessel Code, Section IX using welding procedures per the minimum requirements of MSS SP-58.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's catalog data including code compliance, load capacity, and intended application.

B. Manufacturer's Installation Instructions: Indicate special procedures and assembly of components.

C. Shop Drawings: Submit detailed Drawings of all shop or field fabricated supports, anchors and sleeves, signed and sealed by a qualified State of Texas registered professional engineer. Indicate size and characteristics of components and fabrication details and all loads exceeding 250 pounds imposed on the base building structure.

1.06 DELIVERY, STORAGE AND HANDLING

A. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Maintain in place until installation.

C. Store materials protected from exposure to harmful weather conditions.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.02 MANUFACTURERS

A. Hangers and Supports:

1. Anvil International.
2. Kinder.
3. Cooper B-Line.
4. C & S Mfg. Corp.

5. Hubbard Enterprises/Holdrite

6. National Pipe Hanger Corporation.

7. Power Strut.

2.03 HANGERS AND SUPPORTS

A. General:

1. Refer to individual system and equipment Specification Sections for additional support requirements. Comply with MSS SP-69 for support selections and applications that are not addressed within these Specifications.

2. Utilize hangers and supports to support systems under all conditions of operation, allowing free expansion and contraction, and to prevent excessive stresses from being introduced into the structure, piping or connected equipment.

3. All pipe supports shall be of the type and arrangement to prevent excessive deflection, to avoid excessive bending stresses between supports, and to eliminate transmission of vibration.

4. Design hangers to impede disengagement by movement of supported pipe.

5. Install building attachments within concrete slabs or attach to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping.

6. Wire or perforated strap iron will not be acceptable as hanger material.

7. Hanger rods shall be threaded on both ends, threaded one end, or continuous threaded, complete with adjusting and lock nuts.

8. Fasteners requiring explosive powder (shooting) or pneumatic-driven actuation will not be acceptable under any circumstances.

9. Plastic anchors or plastic expansion shields will not be permitted under any circumstances.

10. Hangers and clamps supporting and contacting individual non-insulated brass or copper lines shall be copper or copper plated. Where non-insulated brass or copper lines are supported on trapeze hangers or channels, the pipes shall be isolated from these supports with approved flexible elastomeric/thermoplastic isolation cushion material to completely encircle the piping and avoid contact with the channel or clamp. Plastic tape is not acceptable.

11. Hangers and clamps supporting and contacting glass piping shall be in accordance with the piping manufacturer’s published recommendations and shall be fully lined with minimum 1/4 inch neoprene padding. The padding material and the configuration of its installation shall be submitted for approval.

12. Hangers and clamps supporting and contacting plastic piping shall be in accordance with the piping manufacturer’s published recommendations and shall be factory coated or padded to prevent damage to piping.

13. Field fabricated supports shall be constructed from ASTM A36/A36M, steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.

B. Finishes: All ferrous hangers, rods, inserts, clamps, stanchions, and brackets on piping within interior non-corrosive environments, shall be dipped in Zinc Chromate Primer before installation. Rods may be galvanized or cadmium plated after threading, in lieu of dipping zinc chromate. All hangers and supports exposed to the weather, including roofs and building crawl space areas, shall be galvanized or manufactured from materials that will not rust or corrode due to moisture. All hangers and supports located within corrosive environments shall be constructed from or coated with materials manufactured for installation within the particular environment.

C. Vertical Piping: Supports for vertical riser piping in concealed areas shall utilize double bolt riser clamps, with each end having equal bearing on the building structure at each floor level. Two-hole rigid pipe clamps or four-hole socket clamps with washers may be used to support pipe directly from adequate structural members where floor-to-floor distance exceeds required vertical support spacing and lines are not subject to expansion and contraction. Supports for vertical riser piping at floor levels in exposed areas (such as fire protection standpipe in stairwells) shall be attached to the underside of the penetrated structure utilizing drilled anchors, two hanger rods (sized as specified), and socket clamp with washers.

D. Trapezes: Where multiple lines are run horizontally at the same elevation and grade, they may be supported on manufactured channel, suspended on rods or pipes. Trapeze members including suspension rods shall be properly sized for the quantity, diameters, and loaded weight of the lines they are to support.

E. Ductwork: All ductwork shall be supported in accordance with SMACNA recommendations for the service involved. Horizontal ducts supported using galvanized steel bands shall extend up both sides and onto the construction above, where they shall turn over and be secured with bolts and nuts fitted in inserts set in the concrete, bolted to angles secured to the construction above, or secured in another approved manner.

F. Terminal Units:

1. Terminal units weighing up to 150 pounds shall be supported by four (4) 1 inch wide sheet metal straps with ends turned under bottom of unit at corners.

2. Each band shall be secured by not over 3/4 inch in length, 1/4 inch diameter sheet metal screws – two (2) on bottom of unit and one (1) on each side.

3. The other strap end shall be attached to the structure by 1/4 inch diameter threaded bolt into the concrete insert or into drilled-hole threaded concrete expansion anchor.

4. Where interference occurs, overhead of the box, not allowing direct vertical support by straps, provide trapeze channels suspended by 1/4 inch diameter galvanized threaded rods providing such channels do not block access panels of units.

5. Terminal units weighing more than 150 pounds shall be supported per the terminal unit manufacturer’s installation instructions using threaded rod and hanger brackets located per manufacturer’s drawing.

G. Fixture and Equipment Service Piping:

1. Piping at local connections to plumbing fixtures and equipment shall be supported to prevent the weight of the piping from being transmitted to fixtures and equipment.

2. Makeshift, field-devised methods of plumbing pipe support, such as with the use of scrap framing materials, are not allowed. Support and positioning of piping shall be by means of engineered methods that comply with IAPMO PS 42-96. These shall be Hubbard Enterprises/Holdrite support systems, C & S Mfg. Corp. or Owner-approved equivalent.

3. Supports within chases and partitions shall be corrosion resistant metal plate, clamps, angles or channels, and aligned with structure in the vertical or horizontal position. Plastic

supports are not allowed unless approved by Owner.

4. Horizontal supports within chases and partitions that are attached to studs shall be attached at both ends. Drywall shall not be relied upon to support the piping.

5. Supports for plumbing fixture water service piping within chases and partitions may be attached to cast iron drain and vent pipe with approved brackets and pipe clamps.

6. Piping exposed on the face of drywall shall be supported with corrosion resistant metal channels that are attached to wall studs. Drywall shall not be relied upon to support the piping.

7. Piping supported from the floor shall utilize corrosion resistant metal channels or brackets that are anchored to the floor slab.

8. All water piping shall be isolated from building components to prevent the transmission of sound.

9. All copper or brass lines shall be isolated from ferrous metals with dielectric materials to prevent electrolytic action. Plastic tape is not an acceptable isolation material.

H. Fire Protection Piping: All hangers and supports for fire standpipe systems and fire sprinkler systems shall be Factory Mutual and Underwriters' Laboratories, Inc. listed and labeled.

I. Inserts:

1. Cast-in-place concrete inserts shall comply with MSS-SP-69, U.L. and F.M. approved, and sized to suit threaded hanger rods.

2. Inserts shall have malleable iron case with galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods. Suitable concrete inserts for pipe and equipment hangers shall be set and properly located for all pipe and equipment to be suspended from concrete construction. If the inserts are later found not to be in the proper location for the placement of hangers, then drilled anchors shall be installed. Drilled anchors in concrete or masonry shall be submitted for the approval.

3. Manufactured inserts for metal deck construction shall have legs custom fit to rest in form valleys.

4. Shop fabricated inserts shall be submitted and approved by Owner prior to installation.

5. Inserts shall be of a type that will not interfere with structural reinforcing and that will not displace excessive amounts of structural concrete.

J. Pipe Shields: Provide pipe shields in accordance with insulation manufacturer’s published recommendations. Install MSS SP-58, Type 39 protection saddles, if insulation without vapor barrier is indicated. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier.

K. Housekeeping Pads:

1. Provide minimum 4 inch reinforced concrete pads with chamfered corners and equipment bases for all outdoor equipment on grade, floor mounted equipment in main central plant area, mechanical rooms, areas with floors below grade, penthouse equipment rooms, floor mounted air handling units, and where shown on Drawings.

2. Housekeeping pads shall extend minimum of 4 inch on all sides beyond the limits of the mounted equipment unless otherwise noted.

3. Provide galvanized anchor bolts for all equipment placed on concrete pads or on concrete slabs of the size and number recommended by the equipment manufacturer.

2.04 PIPE AND DUCT PENETRATIONS

A. General:

1. Seal penetrations through all rated partitions, walls and floors with U.L. tested assemblies to provide and maintain a rating equal to or greater than the partition, wall or floor.

2. Inside diameter of all sleeves or cored holes shall provide sufficient annular space between outside diameter of pipe, duct or insulation to allow proper installation of required fire and water proofing materials and allow for movement due to expansion and contraction.

3. Exposed ceiling, floor and wall pipe penetrations within finished areas (including exterior wall faces) shall be provided with chrome plated, brass or stamped steel, hinged, split-ring escutcheon with set screw or snap-on type. Inside diameter shall closely fit pipe outside diameter or outside of pipe insulation where pipe is insulated. Outside diameter shall completely cover the opening in floors, walls, or ceilings. In exterior, damp, or corrosive environments, use Type 302 stainless steel escutcheons.

B. Floor Pipe Penetrations:

1. Seal penetrations through all floors to provide and maintain a watertight installation.

2. Sleeves cast in the slab for pipe penetrations shall be Schedule 40 steel, ASTM A53, with 2 inch wide annular fin water-stop continuously welded at midpoint. Entire assembly shall be hot-dipped galvanized after fabrication. Water-stop shall be same thickness as sleeve.

3. Cored holes in the slab for pipe penetrations shall be provided with a Schedule 40 steel, ASTM A53, sleeve with 2 inch wide annular fin water-stop continuously welded at point on sleeve to allow countersinking into slab and waterproofing. Entire sleeve assembly shall be hot-dipped galvanized after fabrication. Water-stop shall be same thickness as sleeve.

4. All sleeves shall extend a minimum of two inches above finished floor.

5. Where job conditions prevent the use of a sleeve that extends two inches above the slab, Link-Seal mechanical casing seals manufactured by Thunderline Corporation may be installed to provide a watertight penetration. Mechanical casing seals can be used only for relatively small diameter pipe penetrations. Verify that slab thickness allows proper installation of the link-seal assembly and the required fire stopping prior to applying this exception.

C. Wall Penetrations:

1. Where piping or ductwork passes through non-rated partition, close off space between pipe or duct and construction with gypsum wallboard and repair plaster smoothed and finished to match adjacent wall area.

2. Pipe penetrations through interior rated partitions shall be provided with adjustable prefabricated U.L. listed fire rated galvanized sheet metal sleeves having gauge thickness as required by wall fire rating, 20 gauge minimum.

3. Pipe penetrations through exterior walls and walls below grade shall be provided with “Link-Seal” mechanical casing seal manufactured by Thunderline Corporation.

4. Ductwork penetrations through rated partitions, walls and floors shall be provided with

sleeves that are manufactured integral with the damper assembly installed.

D. Flashing:

1. Coordinate flashing material and installation required for pipe and duct roof penetrations with Owner and roofing Contractor.

2. Provide flexible flashing and metal counter-flashing where ductwork penetrates exterior walls. Seal penetration water and air tight.

3. Provide acoustical flashing around ducts and pipes penetrating equipment rooms, with materials and installation in accordance with manufacturer's instructions for sound control.

E. Roof Curbs: Coordinate roof curb material and installation with Owner and roofing Contractor.

PART 3 - EXECUTION

3.01 PREPARATION

A. Conduct a pre-installation meeting prior to commencing Work of this Section to verify Project requirements, coordinate with other trades, establish condition and completeness of substrate, review manufacturer’s installation instructions and manufacturer’s warranty requirements.

3.02 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. Application, sizing and installation of piping, supports, anchors and sleeves shall be in accordance with manufacturer's printed installation instructions.

C. Provide for vertical adjustments after erection and during commissioning, where feasible, to ensure pipe is at design elevation and slope.

D. Install hangers and supports to allow controlled thermal movement of piping systems, permitting freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

E. Install hanger so that rod is vertical under operating conditions.

F. Supports, hangers, anchors, and guides shall be fastened to the structure only at such points where the structure is capable of restraining the forces in the piping system.

G. The load and spacing on each hanger and/or insert shall not exceed the safe allowable load for any component of the support system, including the concrete that holds the inserts. Reinforcement at inserts shall be provided as required to develop the strength required. Contractor shall be responsible for engaging a structural engineer as required for design and review at support systems.

H. Do not hang pipe, duct or any mechanical/plumbing item directly from a metal deck or locate on the bottom chord of any truss or joist unless approved by the Structural Engineer of Record.

I. All supports shall be designed and installed to avoid interference with other piping, hangers, ducts, electrical conduit, supports, building structures, equipment, etc.

J. Piping supports shall be independent from ductwork supports. Combining supports is not permitted.

K. Provide all supporting steel required for the installation of mechanical equipment and materials,

including angles, channels, beams, etc. to suspended or floor supported tanks and equipment. All of this steel may not be specifically indicated on the Drawings.

L. All piping and ductwork supports shall be designed and installed to allow the insulation to be continuous through the hangers.

M. Adjustable clevis hangers shall be supported at rods with a nut above and below the hanger.

N. All hanger rods shall be trimmed neatly so that 1 inch of excess hanger rod protrudes beyond the hanger nut. In the event a rod is intentionally but temporarily left excessively long (for sloped or insulated lines for example), the Contractor shall take appropriate measures to protect the pipe or other materials from damage.

O. Install hangers to provide minimum ½ inch space between finished covering and adjacent structures, materials, etc.

P. Horizontal and vertical piping in chases and partitions shall be supported to prevent movement and isolated from the supports to prevent transmission of sound.

Q. Locate hangers within 12 inches of each horizontal elbow.

R. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

S. Support riser piping independently of connected horizontal piping. Riser piping is defined as vertical piping extending through more than one floor level.

T. Support vertical piping with clamps secured to the piping and resting on the building structure or secured to the building structure below at each floor. Use method of securing the vertical risers to the building structure below in stairwells and exposed locations. Installation of riser clamps and welded steel riser supports shall not allow weight of piping to be transmitted to floor sleeves. Exception: Schedule 40 steel floor sleeves with continuously welded 2 inch minimum water-stop ring.

U. Steel Bar Joists: Hanger rods shall be secured to angle irons of adequate size; each angle shall span across two or more joists as required to distribute the weight properly and shall be welded or otherwise permanently fixed to the top of joists.

V. Steel Beams: Where pipes and loads are supported under steel beams, approved type beam clamps shall be used.

W. Pre-Cast Tee Structural Concrete: Hanger supports, anchors, etc. attached to the precast, double tee, structural concrete system shall be installed in accordance with approved Shop Drawings only. Holes required for hanger rods shall be core drilled in the "flange" of the double tee only; impact type tools are not allowed under any circumstances. Core drilling in the "stem" portions of the double tee is not allowed. Holes core drilled through the "flange" for hanger rods shall be no greater than 1/4 inch larger than the diameter of the hanger rod. Hanger rods shall supported by means of bearing plates of size and shape acceptable to the Architect/Engineer, with welded double nuts on the hanger rod above the bearing plate. Cinch anchors, lead shields, expansion bolts, and studs driven by explosion charges are not allowed under any circumstances in the lower 15 inches of each stem and in the "shadow" of the stem on the top side of the "double tees".

X. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

Y. Inserts:

1. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

2. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

3. Install anchors in concrete after concrete is placed and completely cured. Install anchors according to manufacturer's written instructions.

Z. Flashing:

1. Coordinate all roof flashing with requirements of Division 07.

AA. Pipe Shields:

1. Provide shields at each hanger supporting insulated pipe.

2. Provide shields of the proper length to distribute weight evenly and to prevent compression of insulation at hanger.

3. Install shield so that hanger is located at the center of the shield.

4. Attach shield to insulation with adhesive to prevent slippage or movement.

BB. Equipment Anchor Bolts:

1. Foundation bolts shall be placed in the forms when the concrete is poured, the bolts being correctly located by means of templates. Each bolt shall be set in a sleeve of sufficient size to provide ½ inch clearance around bolt.

END OF SECTION 22 05 29

SECTION 220548 - VIBRATION ISOLATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. Perform all Work required to provide and install inertia bases and vibration isolation indicated by the Contract Documents with supplementary items necessary for their proper installation.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and Workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. ASHRAE - Guide to Average Noise Criteria Curves.

1.04 QUALITY ASSURANCE

A. Provide for vibration isolation supports for all equipment, piping and ductwork indicated herein. The transmission of perceptible vibration, structural borne noise or objectionable air borne noise to occupied areas by equipment installed under this Contract will not be permitted. Install vibration isolators as specified herein or shown on the Drawings or otherwise required to prevent the transmission of vibration which would create objectionable noise levels in occupied areas.

B. The vibration isolation supplier must be a firm capable of dealing effectively with vibration and noise characteristics effects and criteria; and one that can provide facilities and capabilities for measuring and evaluating the aforementioned disturbances.

C. Maintain ASHRAE criteria for average noise criteria curves for all equipment at full load condition.

D. Provide vibration isolation devices, from a single manufacturer or supplier who will be responsible for complete coordination of all phases of this Work.

1.05 LEED AND SUSTAINABILITY

A. Product Data for Credit IEQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content.

B. Laboratory Test Reports for Credit IEQ 4: For adhesives and sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Submit MSDS sheets showing compliance with Section 01 81 13 – Sustainable Design Requirements.

D. Sealants shall meet the requirements of SCAQMD r1168 and CDPH v1.1-2010 for emissions

E. Paints/Coating shall meet the requirements of SCAQMD r1113 for coatings and CDPH v1.1-2010 for emissions.

1.06 SUBMITTALS

A. Product Data:

1. Submit Shop Drawings, installation instructions, and product data.

2. Indicate vibration isolator locations, with static and dynamic load on each, on Shop Drawings and described on product data.

3. Contractor shall furnish complete submittal data, including Shop Drawings, which shall indicate the size, type and deflection of each isolator; and the supported weight, disturbing frequency and efficiency of each isolator proposed; and any calculations and other information as may be required for the Architect/Engineer to check the isolator selection for compliance with the specification.

B. Record Documents:

1. Indicate inertia bases on Shop Drawings, including dimensions.

2. All steel bases and concrete inertia bases shall be completely detailed, and shall show completely any reinforcing steel that may be required to provide a rigid base for the isolated equipment. Further, the submittal data shall clearly indicate outlined procedures for installing and adjusting the isolators and bases mentioned above.

3. Submittals on riser isolation system shall show initial and final loads on the structure at each support point, initial and final deflection of each isolator, amount and direction of each deflection change, total expansion and contraction of each riser and operating temperature of 180 degrees F in the riser.

4. Riser diagrams shall be prepared by the vibration isolation manufacturer and submitted for approval. These diagrams shall show initial and final spring deflections, amount and direction of deflection changes, overall expansion and contraction of the riser, and operating temperature of the medium.

5. Submittal data shall include certification that the riser system has been examined for excessive stresses and that none will exist in the design proposed when installed in accordance with submittal and these Specifications.

C. Operation and Maintenance Data:

1. Provide manufacturer’s recommended maintenance procedures.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. All vibration isolators and bases shall be designed for and treated for resistance to corrosion.

C. Steel components shall be PVC coated or phosphated and painted with industrial grade enamel. All nuts, bolts and washers shall be zinc-electroplated or cadmium plated.

D. All isolators exposed to the weather shall have steel parts hot-dip galvanized or zinc-electroplated plus coating of Neoprene or Bitumastic paint. Aluminum components for outdoor installation shall be etched and painted with industrial grade enamel.

E. Required spring deflections for isolators supporting various items of equipment are shown on the Drawings or tabulated elsewhere in these Specifications, but in no case shall be less than one inch. Springs shall be capable of 30 percent over-travel before becoming solid.

F. Where height-saving brackets for side mounting of isolators are required, the height-saving brackets shall be designed to provide for an operating clearance of 2 inches under the isolated structure and designed so that the isolators can be installed and removed when the operating clearance is 2 inches or less. When used with spring isolators having a deflection of 2-1/2 inches or more, the height-saving brackets shall be of the pre-compression type to limit exposed bolt length between the top of the isolator and the underneath side of the bracket.

G. All isolators supporting a given piece of equipment shall limit the length of the exposed adjustment bolt between the top and base to a maximum range of 1 inch to 2 inches.

H. All isolators supporting a given piece of equipment shall be selected for approximately equal spring deflection.

I. Isolators for equipment installed outdoors shall be designed to provide adequate restraint due to normal wind conditions and to withstand wind load of 55 pounds per square foot applied to any exposed surface of the equipment without failure.

2.02 MANUFACTURERS

A. Amber Booth.

B. Korfund Dynamics.

C. Consolidated Kinetics.

D. Mason Industries.

2.03 ISOLATION BASES

A. Type SFB: A structural steel fan and motor base with NEMA standard motor side rails and holes drilled to receive the fan and motor. The steel members shall be adequately sized to prevent distortion and misalignment of the drive.

B. Type CPF: Concrete inertia base, consisting of full depth perimeter steel pouring form, 3000 psi concrete reinforcing bars welded in place, bolting templates with anchor bolts and height-saving brackets for side mounting of the isolators. The base shall be sized with a minimum overlap of 4 inches around the base of the equipment. Fan bases are to be supplied with NEMA standard motor slide rails.

C. The bases for pumps shall be sized to support the suction elbow of end suction pumps and both the suction and discharge elbows of horizontal split-case pumps. The bases shall be T-shaped where necessary to conserve space.

D. Structural bases shall be thoroughly cleaned of welding slag and primed with zinc-chromate or metal etching primer. A finish coat of industrial grade enamel shall be applied over the primer.

2.04 ISOLATOR TYPES

A. Isolator types and required deflections are specified under "Application." Isolator type designations are Amber Booth designators. The isolators shall comply with the following descriptions for each type required on the Project:

1. Type XL: Aluminum-housed, adjustable, spring mounting having telescoping top and bottom sections separated by resilient inserts of Neoprene or other suitable material to limit horizontal motion. The inserts shall be permanently lubricated to minimize vertical friction. Steel or cast iron housings may be used if they are hot-dip galvanized after fabrication. A Neoprene pad having a minimum thickness of ¼ inch shall be bonded to the baseplate.

2. Type SW: Adjustable, freestanding, open-spring mounting with combination leveling bolt and equipment fastening bolt. The spring mounting to baseplate and compression plate must be rigid. The neoprene pad with a minimum thickness of ¼ inch is bonded to the baseplate. A minimum horizontal-to-vertical spring rate of 1.0 is required.

3. Type BS: Spring hanger consisting of a rectangular steel box, coil spring, spring retainers, neoprene-impregnated fabric washer and steel washer.

4. Type BSA: Spring hanger consisting of a rectangular steel box capable of 200 percent minimum overload without visible deformation, coil spring, spring retainers, neoprene impregnated fabric washer and steel washer. Incorporate a 30 degree angularity feature that will permit up to a 15 degree misalignment of the hanger rod from the vertical without shorting out to the hanger box.

5. Type BSR: Combination spring and rubber hanger consisting of a rectangular steel box, coil spring, spring retainers and elastomeric mounting designed for ½ inch deflection.

6. Type BSRA: Combination spring and elastomeric hanger consisting of a rectangular steel box capable of 200 percent minimum overload without visible deformation, coil spring, spring retainers and elastomeric element. Incorporate a 30 degree angularity feature that will permit up to a 15 degree misalignment of the hanger rod from the vertical without shorting out to the hanger box.

7. Type RSW: Adjustable spring isolator as describe for Type SW with the addition of a fabricated steel housing suitable for recessing into a concrete inertia block. The housing has a side access.

8. Type PBS: Spring hanger as described for Type BS with the addition of a load transfer plate to hold the equipment or piping at a fixed elevation during installation and to permit transferring the load to the spring after installation.

9. Type PBSA: Spring hanger consisting of a rectangular steel box capable of 200 percent minimum overload without visible deformation, with the addition of a load transfer plate to hold the equipment or piping at a fixed elevation during installation, and to permit transferring the load to the spring after installation, a coil spring, spring retainers, neoprene impregnated fabric washer and steel washer. Incorporate a 30 degree angularity feature that will permit up to a 15 degree misalignment of the hanger rod from the vertical without shorting out to the hanger box.

10. PBSR: Combination spring and elastomeric hanger as described for Type BSR with the addition of a load transfer plate to hold the equipment or piping at a fixed elevation during installation and to permit transferring the load to the spring after installation.

11. Type PBSRA: Combination spring and elastomeric hanger consisting of a rectangular steel box capable of 200 percent minimum overload without visible deformation, with the addition of a load transfer plate to hold the equipment or piping at a fixed elevation during installation, a coil spring, spring retainers and elastomeric element. Incorporate a 30 degree angularity feature that will permit up to a 15 degree misalignment of the hanger rod from the vertical without shorting out to the hanger box.

12. Type CT: Adjustable, open-spring isolator having one or more coil springs attached to a top compression plate and a base plate. A neoprene pad with a minimum thickness of ¼ inch is bonded to the base plate. The spring assembly must fit within a welded steel enclosure consisting of a top plate and rigid lower housing, which serves as a blocking device during installation. The isolator includes restraining bolts for connecting the top plate and lower housing to prevent the isolated equipment from rising when drained of water.

13. Type SP-NRE: Pad-type mounting consisting of two layers of 3/8 inch thick ribbed or waffled neoprene pads bonded to a 16 gauge galvanized steel separator plate. Size pads for approximately 20 to 40 psi load and a deflection of 0.12 to 0.16 inch.

14. Type BRD: Elastomeric hanger consisting of a rectangular steel box and an elastomeric isolation element of neoprene. A high-quality synthetic rubber may be used if it contains antiozone and antioxidant additives. The elements are designed for approximately ½ inch deflection and loaded so that the deflection does not exceed 15 percent of the free height of the element.

15. Type TRK: For static pressure of 3 inch water or greater, provide a set of spring-loaded thrust resistors (two or more) installed across the flexible duct connection on the fan discharge, designed to limit the movement of the fan. Coil spring static deflection capabilities of thrust resistors shall equal those of the isolators supporting the equipment up to a maximum of 2 inches.

16. Type RVD: An elastomeric mounting having a steel baseplate with mounting holes and a threaded insert at top of the mounting for attaching equipment. All metal parts shall be completely embedded in the elastomeric material. Mountings shall be designed for approximately ½ inch deflection.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. Install motor driven equipment with vibration isolators.

D. Set steel bases for one-inch clearance between housekeeping pad and base. Set concrete inertia bases for 2 inch clearance. Adjust equipment level.

E. Isolate pumped water-piping systems with spring-type vibration isolators to produce a floating mechanical system. Provide spring isolators on piping connected to isolated equipment as follows: Static deflection for the two supports closest to equipment on each pipe connected to the equipment shall be equal to the deflection of isolated equipment. All other supports for horizontal piping shall have a minimum operating deflection of ¾ inch with a capability of an additional 50 percent travel to solid.

F. All open-type spring isolators shall be restrained as recommended by the manufacturer.

G. Pumps:

1. Each centrifugal pump and its driving motor shall be mounted on a common inertia base and the base, in turn, shall be mounted on the scheduled vibration isolator type to prevent transmission of vibration and noise to the building structure.

2. In general, all inertia bases shall be formed and poured in place onto a hard, flat surface from which the base can be separated when cured. The base shall be shimmed, using flat material, to the intended final height prior to equipment mounting and piping connection.

3. After piping connections are made and the system filled with water and ready to put into service, the isolator adjustment bolts shall be extended until the shim blocks can be removed. Isolators may then be backed down slightly to restore the intended height. The locknuts should then be tightened on the isolators. Jack bolts shall be trimmed to a length that will allow no more than 1 inch of additional height adjustment. After final adjustment, the inertia base shall not support any piping load. All springs supporting piping that is connected to a piece of isolated equipment shall be sized for static deflection equal to that of the isolated equipment.

H. Piping (Including Generator Piping):

1. Floor mounted supports shall have the same type of isolator or media as is used for the nearest isolated equipment connected to the piping.

2. The pipe hanger system shall have provisions for all piping to be shimmed or blocked in place until all connections are made and the system filled with water; then, the isolators adjusted to support the weights and the shim blocks removed.

3. The first three support points from a piece of isolated equipment shall be of the positioning type and provide not less than the static deflection of the equipment isolators.

4. All springs supporting piping shall be capable of an additional ½ inch deflection prior to complete compression and springs supporting vertical risers shall have provisions for limit stops.

5. Support risers up through 16 inches at every third floor, and risers 18 inches and over at every second floor. All supports for risers must have a deflection capability at least four times the anticipated expansion and contraction. Install temporary anchors as required to permit preadjustment of springs in the risers. Furnish permanent limit stops to prevent excessive vertical motion of risers in the event risers are drained. Wall sleeves for takeoffs from risers shall be sized for insulation outside diameter plus two times the calculated thermal movement to prevent binding.

I. Resilient Sleeves: Resilient sleeves shall be provided at all points where equipment room walls, floors or ceilings are penetrated by ducts, piping or refrigerant line, etc.

J. Fans and Air Handling Units: Such units shall have electrical flexible connections not less than 36 inches long and the flexible duct connections with a free length of not less than 8 inches.

K. Ductwork: Isolate all high pressure ductwork within each equipment room and to a minimum of 50 feet from fan with Type BS hangers or Type SW floor supports, sized for ¾ inch deflection.

L. To prevent excessive transfer of piping load from floor to floor, all water riser support springs shall have a deflection capability of four times the expansion or contraction to be accommodated by the support with the additional runout capability to absorb the movement. Isolators supporting steam and diesel engine exhaust risers shall be selected for deflections equal to two times the anticipated thermal movement at the support point. Riser isolation system shall be designed such that it supports the riser in tension, eliminating the need for guides; requires no anchors; and has a zero movement point at or near the center to divide thermal movement approximately in half, thus reducing vertical movement of horizontal pipe takeoffs.

3.02 APPLICATION

A. The following is a schedule of equipment on a typical project that requires vibration isolation and base isolators of the types specified. Refer to Drawings for equipment scheduled for the Project. Any equipment, system or condition that may be altered, added, or changed; or that is not specifically described in the Contract Documents shall be isolated in a manner specified for similar equipment, system or condition in order to comply with these Specifications.

Equipment Type	Isolator Type/ Minimum Deflection (Inches)	Base Type
Air Handling Units		
Floor Mounted – Up to 15 HP	SW 2”	N/A
Floor Mounted – 15 HP and Over	SW2.4”	N/A
Suspended – Up to 15 HP	PBSRA 2”	SFB
Fan Coil Units – Suspended	PBSRA 1”	N/A
Centrifugal Fans Class I and II – Up to 54-¼ inch Diameter Up to 15 HP	SW 2”	SFB (If required)
Vane Axial Fans	SW 4.5” with TRK 2”	SFB
Vent Sets:		
Floor Mounted – Up to 15 HP	SW 1.5”	SFB (If required)
Suspended – Up to 15 HP	PBSRA 1.5”	SFB (If required)
Compressors	CT 1.5”	N/A
Engine Driven Generators:		
Skid Mounted	CT 3”	N/A
Exhaust Pipe	PBSRA 3”	N/A
Pumps:		
Up to 5 HP	RSW 0.5”	CPF
5 HP to 10 HP	RSW 1”	CPF
10 HP and Over	RSW 2”	CPF
Vacuum Pumps	RSW 1”	CPF

B. Piping Application:

1. Type PBSRA for hangers in all horizontal piping at equipment; except at connections to risers use BS.

2. Type SW for all floor supports of floor supported piping at equipment or stanchion.

END OF SECTION 20 05 48

SECTION 22 05 53 - PIPING AND EQUIPMENT IDENTIFICATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. Perform all Work required to provide and install Owner's equipment tags, valve tags, stencils, and pipe markers indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Contractor shall make it possible for Owner's personnel that will operate and maintain the equipment and systems in this Project to readily identify the various pieces of equipment, valves, piping, ductwork, etc., by marking them.

C. All items of equipment such as fans, pumps, etc., shall be clearly marked using equipment tags as hereinafter specified. The tagged item of equipment shall correspond to the same number as shown on the Drawings.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and Workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. ASME A13.1 - Scheme for the Identification of Piping Systems.

2. NFPA 13 – Installation of Sprinkler Systems.

3. NFPA 14 – Installation of standpipe and Hose Systems.

4. Uniform Mechanical Code

5. Uniform Plumbing Code

1.04 SUBMITTALS

A. Product Data:

1. Provide manufacturer's catalog literature for each product.

B. Record Documents:

1. Submit valve schedule complete with asset number, building number, room number, valve tag numbering system, valve function, valve type, area served, year installed, manufacturer, model number, size, rated pressure, temperature rating and normal position.

C. Operation and Maintenance Data:

1. Manufacturer’s Installation Instructions: Indicate special procedures and installation.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.02 MANUFACTURERS

A. Equipment Tags, Valve Tags, Markers, and Tacks:

1. Marking Systems, Inc.

2. Seton Name Plate Company.

3. W.H. Brady Company.

4. Graphic Products, Inc.

2.03 EQUIPMENT TAGS

A. Description: 3” x 4” vinyl label, 3.0 Mil self adhesive vinyl similar to DuraLabel Pro. Label color shall be black text on a white background. The label shall contain the following information per the template, described in Attachment “C”:

1. Equipment name: Per Owner’s Equipment Naming convention and as listed in Contractor’s Equipment List/Matrix.

2. Function

3. Area served

B. All scheduled equipment shall be identified with an Equipment Tag.

C. Refer to Specification Section 01 91 00, General Commissioning Requirements for a detailed description of Equipment List/Matrix information.

2.04 VALVE TAGS

A. Valve tags shall conform to ANSI A13.1-1981 "Scheme for the Identification of Piping Systems", refer to Attachment “B” for abbreviation and label color designations.

B. Valve tags shall be ABS plastic tags: Injected molded ABS plastic, 3.375” X 4.75” with self adhesive vinyl label, similar to DuraLabel Pro, affixed to valve tag. Each tag shall be attached to its valve with one tie strap.

C. Vinyl Label: 3.0 Mil self adhesive vinyl similar to DuraLabel Pro. Label color shall be as per the standard designated colors listed in the attachment to this specification. The label shall contain the following information as per template, refer to Attachment “C”:

1. Valve name:

2. Function

3. Area served

D. Each valve shall be named as per attached valve tag naming convention, refer to Attachment “D”.

E. In addition to valve tags, valves at water headers and steam PRV stations, valves associated with condensate, gas, water meters, and other valves as specified shall be tagged with standardized color coded plastic tags. Each tag shall be attached to its valve with one tie strap. These tags shall be 2-½ inches wide by 1-½ inches high with these color codings:

1. Red = normally closed.

2. Green = normally open.

3. Blue = open in winter, closed in summer.

4. Yellow = closed in winter, open in summer.

F. Valve Tag Fasteners: Single ABS plastic tie strap.

2.05 PIPE AND DUCT MARKERS

A. Round Pipe and Duct Markers shall conform to ANSI A13.1-2007 "Scheme for the Identification of Piping Systems", refer to Attachment “B” for abbreviation and label color designations. Arrow markers must have same ANSI background colors as their companion pipe markers, or be incorporated into the pipe identification marker.

B. Rectangular Duct Stencils shall conform to ANSI A13.1-2007 "Scheme for the Identification of Piping Systems", refer to Attachment “B” for abbreviation and label color designations. Letter height shall be a minimum of 1-1/4”. Stencil material shall be fiber board; Stencil paint shall be exterior, gloss, acrylic enamel.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Plastic Tape Pipe Markers: Heat sealed or heat shrink, spring fasteners, clips or snap-on, are acceptable.

E. Underground Plastic Pipe markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

F. All medical gas piping shall have minimum information per NFPA 99, plus operating pressure.

G. Pipe markers and arrow markers also shall be provided for all piping systems.

H. Use Seton Setmark Type SNA or Brady snap-on type identification for all piping systems, up through 6 inch. For piping systems larger than 6 inches, use Seton or Brady strap-on markers or similar by Marking Services, Inc.

2.06 LOCATER TACKS FOR EQUIPMENT LOCATED ABOVE LAY-IN CEILING

A. Description: Steel with ¾-inch diameter color-coded head.

B. Color code as follows:

1. Yellow - HVAC equipment fan-coil units, exhaust fans and terminal units.

2. Red - Fire dampers/smoke dampers.

3. Green - Plumbing valves,.

4. Blue - Heating/cooling valves.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. Install plastic tape, and pipe markers completely around pipe in accordance with manufacturer's instructions.

D. Locate markers on the two (2) lower quarters of the pipe where view is unobstructed.

E. Locate tacks on the ceiling grid.

3.02 APPLICATION OF MARKERS AND STENCILS

A. Piping runs throughout the Project including those above lift-out ceilings, under floor and those exposed to view when access doors or access panels are opened shall be identified by means of pipe markers and/or stencils. Concealed areas, for purposes of this identification section, are those areas that cannot be seen except by demolition of the building elements. In addition to pipe markers and/or stencils, arrow markers shall be used to indicate direction of flow.

B. As a minimum, locate pipe markers and/or stencils as follows:

1. Provide a pipe marker at each valve to indicate proper identification of pipe contents. Where several valves exist on one (1) header, it is necessary to mark only the header.

2. Every 20 feet in exposed and concealed areas on all piping systems. Provide at least one (1) pipe marker in each room on all piping systems.

3. At each branch or riser take off on piping systems, excluding short takeoffs for fixtures and terminal units.

4. Provide a pipe marker or stencil and an arrow marker at every point of pipe entry or exit where the pipe penetrates a wall, floor, service column or enclosure.

5. At access doors, manholes and similar access points that permit view of concealed piping.

6. Near major equipment items and other points of origination and termination.

C. Provide an arrow marker with each pipe marker pointing away from the pipe marker to indicate direction of flow.

D. Provide a double-ended arrow marker when flow can be in either or both directions.

E. Indicate delivered water temperature on domestic hot water supply and return lines.

F. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

G. Identify control panels and major control components outside panels with plastic nameplates.

H. Identify valves in main and branch piping with tags.

I. Identify air terminal units and radiator valves with plastic nameplates.

J. Tag automatic controls, instruments and relays. Key to control schematic.

K. Provide ceiling tacks to locate valves, fan coil units, dampers or other concealed equipment above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

L. Identify pipe utilizing copper press fittings with markers stating, “Press-Fit” adjacent to each content identification marker.

M. Identify medium pressure gas piping (14 inches water column to 5psi) with the statement, “WARNING – ½ to 5psi NATURAL GAS”.

N. Identify right and left nipple and coupling union assemblies with the statement “Right/Left Nipple/Coupling”.

END OF SECTION 20 05 53

SECTION 220719 – PIPING INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, Division 20 & Division 23 Specification Sections, apply to this Section.

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. Perform all Work required to provide and install piping insulation, jackets and accessories indicated by the Contract Documents with supplementary items necessary for proper installation.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and Workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

2. ASTM C168 - Terminology Relating to Thermal Insulation Materials.

3. ASTM C177 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded- Hot-Plate Apparatus.

4. ASTM C195 - Mineral Fiber Thermal Insulating Cement.

5. ASTM C335 - Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.

6. ASTM C449 - Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.

7. ASTM C518 - Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

8. ASTM C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

9. ASTM C547 - Mineral Fiber Pipe Insulation.

10. ASTM C552 - Cellular Glass Thermal Insulation.

11. ASTM C578 - Rigid, Cellular Polystyrene Thermal Insulation.

12. ASTM C585 - Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).

13. ASTM C591 - Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.

14. ASTM C610 - Molded Expanded Perlite Block and Pipe Thermal Insulation.

15. ASTM C921 - Jackets for Thermal Insulation.

16. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.

17. ASTM D1667 - Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Closed Cell Foam).

18. ASTM D2842 - Water Absorption of Rigid Cellular Plastics.

19. ASTM C795 - Insulation For Use Over Austenitic Steel.

20. ASTM E84 - Surface Burning Characteristics of Building Materials.

21. ASTM E96 - Water Vapor Transmission of Materials.

22. NFPA 255 - Surface Burning Characteristics of Building Materials.

23. UL 723 - Surface Burning Characteristics of Building Materials.

1.04 DEFINITIONS

A. Concealed: Areas that cannot be seen by the building occupants.

B. Interior Exposed: Areas that are exposed to view by the building occupants, including underneath countertops, inside cabinets and closets, and all equipment rooms.

C. Interior: Areas inside the building exterior envelope that are not exposed to the outdoors.

D. Exterior: Areas outside the building exterior envelope that are exposed to the outdoors, including building crawl spaces and loading dock areas.

1.05 QUALITY ASSURANCE

A. All piping requiring insulation shall be insulated as specified herein and as required for a complete system. In each case, the insulation shall be equivalent to that specified and materials applied and finished as described in these Specifications.

B. All insulation, jacket, adhesives, mastics, sealers, etc., utilized in the fabrication of these systems shall meet NFPA for fire resistant ratings (maximum of 25 flame spread and 50 smoke developed ratings) and shall be approved by the insulation manufacturer for guaranteed performances when incorporated into their insulation system, unless a specific product is specified for a specific application and is stated as an exception to this requirement.

1. Certificates to this effect shall be submitted along with Contractor's submittal data for this Section of the Specifications.

2. No material shall be used that, when tested by the ASTM E84-89 test method, is found to melt, drip or delaminate to such a degree that the continuity of the flame front is destroyed, thereby resulting in an artificially low flame spread rating.

C. Application Company Qualifications: Company performing the Work of this Section must have minimum three (3) years experience specializing in the trade.

D. All insulation shall be applied by mechanics skilled in this particular Work and regularly engaged in such occupation.

E. All insulation shall be applied in strict accordance with these Specifications and with factory printed recommendations on items not herein mentioned. Unsightly, inadequate, or sloppy Work will not be acceptable.

1.06 LEED AND SUSTAINABILITY

A. Product Data for Credit IEQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content.

B. Laboratory Test Reports for Credit IEQ 4: For adhesives and sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Submit MSDS sheets showing compliance with Section 01 81 13 – Sustainable Design Requirements.

D. Sealants shall meet the requirements of SCAQMD r1168 and CDPH v1.1-2010 for emissions

E. Paints shall meet the requirements of SCAQMD r1113 for coatings and CDPH v1.1-2010 for emissions.

F. Insulation shall contain no added formaldehyde and be certified with CDPH v1.1-2010 for emissions

1.07 SUBMITTALS

A. Product Data:

1. Provide product description, list of materials, “k” value, “R” value, mean temperature range, and thickness for each service and location.

2. Samples: When requested, submit three (3) samples of any representative size illustrating each insulation type

B. Operation and Maintenance Data:

1. Indicate procedures that ensure acceptable standards will be achieved. Submit certificates to this effect.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the Project Site in original factory packaging, labeled with manufacturer’s identification including product thermal ratings and thickness.

B. Store insulation in original wrapping and protect from weather and construction traffic. Protect insulation against dirt, water, chemical, and mechanical damage.

C. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics and insulation cements.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Per AEGB IEQ7, all insulation must contain no added formaldehyde resins (including urea, phenol, and urea-extended phenol)

2.02 MANUFACTURERS

A. Insulation:

1. Owens-Corning (Type P1).
2. Certainteed Corporation (Type P1).
3. Johns Manville Corporation (Type P1).
4. Knauf Corporation (Type P1).
5. Dow Chemical Company (Type P2).
6. Armstrong/Armacell (Armaflex) (Type P3).
7. RBX Industries/Rubatex (Type P3).
8. Industrial Insulation Group, LLC (Type P4).
9. FOAMGLAS (Cellular Glass) by Pittsburgh Corning (Type P6).

B. Jackets:

1. Childers Products Company.
2. PABCO.
3. RPR Products, Inc.
4. Alpha.
5. Venture Tape Corporation
6. Foamglas

2.03 INSULATION

A. Type P1: Fiberglass preformed insulation; ASTM C 547; minimum 3.0 lb/cu ft density, ASTM C335,'k' value of 0.23 at 75 degrees F; noncombustible.

B. Type P2: Molded closed cell polyisocyanurate insulation; ASTM E96, maximum water vapor transmission rating of 0.005 Perm-In; ASTM C518, 'k' value of 0.20 at 75 degrees F; ASTM D2842, water absorption value of 0.05 lb/ft2.

C. Type P3: Elastomer, closed cell, flexible, insulation; ASTM E96; maximum vapor transmission rating of 0.20 perms; ASTM C 518; 'k' value of 0.27 at 75 degrees F.

D. Type P4: Mineral Wool; ASTM C 547; preformed insulation high temperature insulation; 'k' value of 0.35 at 300 degrees F.

E. Type P6: Cellular Glass, ASTM C552, 7.5 lbs./cu.ft, density, ASTM E96 (Wet Cup Method) 0.00 water vapor perm , ASTM C518 ‘k’ value of 0.29 at 75 degrees F.

2.04 JACKETS

A. Jacket Materials:

1. Factory Applied Jackets: White kraft bonded to reinforced foil vapor barrier with self-sealing adhesive joints.

2. Fiberglass Cloth Reinforcing Mesh: #10 glass cloth with minimum weight of 3.9 ounces per square yard.

3. Aluminum Jackets: ASTM B 209; 0.020 inch thick; smooth finish with factory applied moisture barrier.

4. Factory Applied Jacket (like Alpha Style: VR-RHD): Provide factory applied ASJ White triple ply laminate polypropylene, mold resistant, metallized polyester vapor barrier film backing.

B. Interior Concealed Applications:

1. Type P1 Insulation: Provide factory applied ASJ white kraft foil vapor barrier.

2. Type P3 Insulation: Finish coat is not required.

3. Type P4 Insulation: Cover with a canvas jacket, Adhesive Prime Coat # CP-52 and Childers #CP-50A HV2 lagging adhesive.

4. Type P6 Insulation: Provide Pittcoat 404 or pre-molded PVC covers per manufacturer's recommendations. Jacketing material is not required when this type of piping insulation is concealed within a piping chase.

C. Interior - Exposed Applications:

D. Type P1, and P2 Insulation: Provide factory applied ASJ white kraft foil vapor barrier. Also finish with canvas jacket or #10 glass membrane with Childers CP-50 or approved equal finish. Apply sizing for finish painting. Verify jacket is suitable for applications.

1. Type P3 Insulation: Finish coat is not required.

2. Type P4 Insulation: Cover with a canvas jacket and Childers CP-50 lagging adhesive.

3. Type P6 Insulation: Provide triple ply laminate polypropylene, mold resistant with a metal foil and polyester vapor barrier film backing.

E. All exposed insulated piping within six feet of the floor shall be protected with an aluminum or stainless jacket material to protect the insulation jacketing material from being torn or punctured.Exterior Applications:

1. Insulate piping system as indicated under Interior - Exposed Applications, prior to final jacket installation.

2. Provide electric heat tracing for all exterior piping where water is susceptible to freezing.

3. Final jacket cover shall be aluminum jacket having integral moisture barrier with seams located at 2 or 10 o'clock position of horizontal piping. All laps must be minimum 2 inches.

2.05 INSERTS SUPPORTS AND SHIELDS

A. Application: Piping ½ inch diameter or larger for all systems except direct buried.

B. Shields shall be made of galvanized steel or made of black iron painted on both sides with a minimum two coats of aluminum paint. Required metal shield sizes are as follows:

Nominal IPS (inches)	Metal Thickness (gage)	Minimum Lengths of Shield (inches)
½ to 1½	18	12
2	14	12

2-½ to 6	12	16
8 and above	10	20

C. Depending on the type of pipe support design, stainless steel bands or aluminum bands may be required to keep shield material next to the jacketing material.

D. Inserts for shields shall be manufactured of 7.5 lb/cu. ft. density cellular glass material suitable for the planned temperature range. Provide factory fabricated inserts with integral galvanized pipe saddles. Inserts shall be the same thickness as the adjacent insulation.

2.06 INSULATION ACCESSORIES

A. Insulation Bands: 3/4 inch wide; 0.007 inch thick galvanized steel when exposed to interior environment, .010 inch thick stainless steel or 0.015 inch thick aluminum when exposed to harsh humid interior environment or outside environment.

B. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum or 0.010 inch thick stainless steel to match jacket.

C. Insulating Cement: ASTM C 195; hydraulic setting mineral wool; Ryder One-Coat.

D. Sealants: Use at valves, fittings and where insulation is terminated. Brush apply sealant to end of insulation and continue along pipe surface. Provide Childers CP-70/CP-76 or equivalent sealant.

E. Adhesives: Use to adhere the longitudinal lap seam of vapor barrier jackets and at butt joints between insulation or fitting covers. Provide Childers CP-82 or approved equal as general purpose adhesive. Use Childers CP-97 fibrous adhesive for calcium silicate or when adhering pipe saddles and shields to the insulation.

F. Primers: Provide Childers CP-50 diluted 50 percent with water or Pittcoat 300 primer thinned with mineral spirits to cover insulating cements prior to finish coating.

G. Finish: Provide Childers CP-30 L.O. as a general purpose finish to coat the longitudinal seams and butt joints of vapor barrier jackets or glass cloth jackets. Use Childers CP-50 reinforced with glass cloth as an adhesive and sizing for canvas and in other locations as indicated.

PART 3 - EXECUTION

3.01 PREPARATION

A. Verify that piping has been pressure tested before applying paint and insulation materials.

B. Thoroughly clean all surfaces to be insulated as required to remove all oil, grease, loose scale, rust, and foreign matter. Piping must be completely dry at the time of application of primer paint. Painting on piping where condensation is occurring on the pipe surface is strictly prohibited.

C. Provide primer coat on all piping, to include field welds and over factory applied paint/coating, in total compliance with Contract Documents and compatible with and approved by the insulation manufacturer. Painting must be completed and approved prior to installation of insulation. Paint shall be applied in accordance with the paint manufactures instructions, environment, and pipe surface temperatures.

D. Painting is not required for piping insulated with P6 cellular glass insulation however piping needs to be dry when using PITTSEAL® CW Sealant, a high performance, MS Polymer based sealant for P6 cellular glass insulation for chilled water applications.

3.02 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. Installation of insulation and jacket materials shall be in accordance with manufacturer's published instructions.

C. Handle and install materials in accordance with manufacturer's instructions in the absence of specific instructions herein.

D. On exposed piping, locate insulation cover seams with the ridge of the lap joint is directed down.

E. Exposed Insulated piping within six feet of the floor shall be protected with an aluminum or stainless jacket material to protect the insulation.

F. Insulate fittings, joints and valves with molded insulation of the same material and thickness as adjoining pipe. Open voids and cracks insulation shall be kept at a minimum when placing insulation on abnormal or irregular shapes. Use closed cell or recommended fill material as instructed by the insulation manufacturer to close openings. Fiberglass insulation shall not be used as a fill material on chilled water piping or fittings.

G. Continue insulation through walls, sleeves, pipe hangers, floors, and other pipe penetrations.

H. Provide dams in insulation at intervals not to exceed 20 feet on cold piping systems to prevent migration of condensation or fluid leaks. Indicate visually where the dams are located for maintenance personnel to identify and also provide dams at butt joints of insulation at fittings, flanges, valves, and hangers.

I. Insulate entire system including fittings, valves, flanges and strainers. Use closed cell insulation on cold piping system flexible connections, expansion joints and unions, bevel and seal ends of insulation and continue sealant a minimum of 4 inches along the piping, unless stated otherwise.

J. For hot piping conveying fluids 180 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation. Continue sealant a minimum of 4 inches along the piping.

K. All sections of molded pipe covering shall be firmly butted together. Where an insulation covering is applied, it shall lap the adjoining section of insulation by at least three inches (3 inches). Where insulation terminates, it shall be neatly beveled and finished. All materials used shall be fire retardant or nonflammable.

L. Where vapor barriers are required, the vapor barrier shall be on the outside. Extreme care shall be taken that the vapor barrier is unbroken. Joints, etc., shall be sealed. Where insulation with a vapor barrier terminates, seal off with vapor barrier continuous to the surface being insulated. Ends shall not be left raw.

M. Where pipe chases are tight, adequate provision shall be made at the rough-in stage using offset fittings or other means (except springing the pipe) to ensure that insulation can be applied throughout the length of the pipe.

N. Paint exposed pipe insulation.

O. INSERTS, SUPPORTS, AND SHIELDS

1. Shields

a. Install between pipe hangers or pipe hanger rolls and inserts. Curved metal shields shall be used between the hangers or support points and at the bottom of insulated pipe.

b. Hangers shall support the load of the insulated pipe section on the outside of the insulation and shall not be in direct contact with the pipe.

c. Manufacturer shall be responsible to size the length of shield required to prevent insulation from breaking.

d. Provide rigid insulation at each support point, a minimum of 2 inches longer than shield length.

e. Curved metal shields shall be designed to limit the bearing stress on the insulation to 35 psi and shall be curved to fit up to mid-perimeter of the insulated pipe.

2. Seal all insulation at supports, protrusions and interruptions. Maintain vapor barrier with finish coat.

P. MAINTENANCE AND INSPECTION METHODS

1. Conduct periodic inspections as determined by the Owner, to address the following :

a. Replace missing insulation and protect adjacent insulation which can become burned or wet after maintenance has been performed to the system.

b. Repair leaks or spills and remove and replace damaged insulation.

c. Repair breaks, tears, cracks, or punctures of the vapor barrier or protective covering. Verify that the existing insulation is dry and if wet replace the entire affected section as described in this section.

d. On piping exposed to the outdoor environment, replace the affected section of insulation as described in this section and use galvanized steel, aluminum or stainless steel to protect the insulation from being crushed due to foot traffic or maintenance equipment. PVC is appropriate for interior areas not subject to foot traffic.

3.03 PIPING INSULATION APPLICATION AND THICKNESS SCHEDULE

A. In no case shall installed piping insulation have insulation thicknesses that are less than what is required by local energy codes and ASHRAE 90.1 (whichever is more stringent), based on comparable insulation conductivity values at the specified mean rating temperature.

Piping Systems	**Location**	**Type**	**Pipe Size**	**Insulation Thickness**
Domestic Hot Water,	All	P6	All Sizes	1-1/2"
Domestic Cold Water	Interior Concealed	P1	1-1/2" & Smaller	1/2”
			2" to 4"	1/2”
			5" & Larger	1/2”
	Interior Exposed	P6	1-1/2" & Smaller	3/4”
			2” to 4”	3/4”
			5” & Larger	1”
	Interior		1-1/2” & Smaller	1”

	Exposed			
			2” to 4	1”
			5” & Larger	1-1/2”
	Exterior	P6	All Sizes 4” and Smaller 5” & Larger	1” 1” 1-1/2”
	Interior Concealed	P1	1-1/2" & Smaller	1/2”
			2" to 4"	1/2”
Condensate Drain	All	P3	All Sizes	1"
Refrigerant Suction Piping (35 Degrees F – Nominal)	All	P3	2-1/2” & Smaller	1"
Underside of all Roof / Overflow Drain Bodies and related horizontal roof drain lines to vertical leader	Interior Exposed	P6	2” to 4”	3/4”
			5” & Larger 2” to 4” 5” & Larger	1” 1” 1-1/2”
	Interior Concealed	P1	2" to 4”	1/2"
			5” & Larger	1/2”
Floor Drain Bodies and related horizontal Sanitary Drain Lines above floor that receive cold condensate drainage.	Interior Exposed	P6	2” to 4”	3/4"
			5” & Larger 2” to 4” 5” & Larger	1" 1” 1-1/2”
Chilled Water	Interior Concealed	P6	4" & Smaller	2”
			6" & Larger	2"
	Interior Exposed	P6	4” & Smaller	2”
			6” & Larger	2”
	Exterior	P6		
			4" & Smaller 6” & Larger	2” 2”
	Underground		Refer to Section 22 07 29	
Heating Hot Water (Maximum 250 Degrees F)	Interior Exposed	P6	2-1/2” & Smaller	2"
			3" & Larger 2-1/2” & Smaller 3" & Larger	2” 2” 2”
	Interior Concealed	P1 P6	2-1/2” & Smaller	2”
			3" & Larger	2-1/2”
			2-1/2” & Smaller 3" & Larger	2”
			2-1/2” & Smaller 3" & Larger	2”
	Exterior	P2 P6	2-1/2” & Smaller	2”
			3" & Larger	2”
			2-1/2” & Smaller 3" & Larger	2” 2”

END OF SECTION 22 07 19

SECTION 221000 - PLUMBING PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. Provide materials and installation for complete first class plumbing systems, within and to five feet beyond building perimeter unless noted otherwise on Contract Drawings; Sanitary Waste and Vent Piping, Storm Drain Piping, Domestic Water Piping, Domestic Water Valves, Testing and other normal parts that make the systems operable, code compliant and acceptable to the authorities having jurisdiction.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. 2018 International Plumbing Code

2. ANSI/NSF Standard 61 - Drinking Water System Components - Health Effects.

1.04 QUALITY ASSURANCE

A. Manufacturer’s name and pressure rating shall be permanently marked on valve body.

B. The Contractor shall notify the manufacturer's representative prior to installing any copper press fittings. The Contractor shall obtain the representative’s guidance in any unfamiliar installation procedures. The manufacturer's representative of copper press fittings shall conduct periodic inspections of the installation and shall report in writing to the Contractor and Owner of any observed deviations from manufacturer’s recommended installation practices.

C. Manufacturer Qualifications: Company shall have minimum three years documented experience specializing in manufacturing the products specified in this section.

D. Installer Qualifications:

1. Company shall have minimum three years documented experience specializing in performing the work of this section.

2. Installation of plumbing systems shall be performed by individuals licensed by the Texas State Board of Plumbing Examiners as a Journeyman or Master Plumber. Installation may be performed by Apprentice Plumbers provided they are registered with the Texas State Board of Plumbing examiners and under direct supervision of a licensed plumber. All installation shall be supervised by a licensed Master Plumber.

3. All installers of copper press fittings shall be trained by the fitting manufacturer's appointed representative. Written notification of training shall be submitted to Owner prior to any installation.

1.05 SUBMITTALS

A. Product Data:

1. Code and Standards compliance, manufacturer's data for pipe, fittings, valves and all other products included within this specification section.

2. Manufacturer’s installation instructions.

B. Record Documents:

1. Record actual locations of valves, etc. and prepare valve charts.

2. Test reports and inspection certification for all systems listed herein.

3. Provide a certificate of completion detailing the domestic water system chlorination procedure and all laboratory test results.

4. Submit proposed location of access panels which vary from quantities or locations indicated on Contract Drawings.

5. Provide full written description of manufacturer’s warranty.

C. Operation and Maintenance Data:

1. Include components of system, servicing requirements, Record Drawings, inspection data, installation instructions, exploded assembly views, replacement part numbers and availability, location and contact numbers of service depot.

1.06 DELIVERY, STORAGE AND HANDLING

A. All materials shall be new, undamaged, and free of rust.

B. Accept valves on Site in shipping containers and maintain in place until installation.

C. Provide temporary protective coating and end plugs on valves not packaged within containers. Maintain in place until installation.

D. Provide temporary end caps and closures on pipe and fittings. Maintain in place until installation.

E. Protect installed piping, valves and associated materials during progression of the construction period to avoid clogging with dirt, and debris and to prevent damage, rust, etc. Remove dirt and debris and repair materials as work progresses and isolate parts of completed system from uncompleted parts.

F. Protect all materials that are to be installed within this project from exposure to rain, freezing temperatures and direct sunlight. EXCEPTION: Materials manufactured for exterior locations.

1.07 EXTRA MATERIALS

A. Provide the Owner with one differential pressure meter kit for use with domestic hot water return circuit balancing valves installed within this project. Kit shall include meter, hoses, connection accessories, circular slide rule, carrying case and valve manufacturer’s curve charts.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Provide materials as specified herein and indicated on Contract Drawings. All materials and work shall meet or exceed all applicable Federal and State requirements and conform to adopted codes and ordinances of authorities having jurisdiction.

C. Pressure ratings of pipe, fittings, couplings, valves, and all other appurtenances shall be suitable for the anticipated system pressures in which they are installed.

2.02 PIPING MATERIALS

A. SANITARY WASTE PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING
   1. PVC Pipe: ASTM D2665 or ASTM D3034.
      a. Fittings: PVC.
      b. Joints: Solvent welded, with ASTM D2564 solvent cement.

B. SANITARY WASTE PIPING, ABOVE GRADE
   1. PVC Pipe: ASTM D2729.
      a. Fittings: PVC.
      b. Joints: Solvent welded, with ASTM D2564 solvent cement.

C. DOMESTIC WATER PIPING, BURIED BEYOND 5 FEET (1500 mm) OF BUILDING
   1. Copper Pipe: ASTM B42, hard drawn.
   2. Copper Pipe: ASTM B42, hard drawn.
      a. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
      b. Joints: ASTM B32, alloy Sn95 solder.
   3. PVC Pipe: AWWA C900.

D. DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING
   1. Copper Pipe: ASTM B42, hard drawn.
      a. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.

E. DOMESTIC WATER PIPING, ABOVE GRADE
   1. Copper Pipe: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
      a. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
      b. Joints: ASTM B32, alloy Sn95 solder.
   2. CPVC Pipe: ASTM D2846/D2846M, ASTM F441/F441M, or ASTM F442/F442M.
      a. Fittings: CPVC; ASTM D2846/D2846M, ASTM F437, ASTM F438, or ASTM F439.
      b. Joints: ASTM D2846/D2846M, solvent weld with ASTM F493 solvent cement.
   3. Cross-Linked Polyethylene (PEX) Pipe: ASTM F876 or ASTM F877.
      a. PPI TR-4 Pressure Design Basis:
         1)160 psig (1102 kPa) at maximum 73 degrees F (23 degrees C).
         2)100 psig (689 kPa) at maximum 180 degrees F (82 degrees C).
      b. Fittings: Brass and copper.
      c. Joints: Mechanical compression fittings.

2.03 DOMESTIC WATER VALVES

A. BALL VALVES
   1. Construction, 4 inch (100 mm, DN) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball,

regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

B. FLOW-BALANCING VALVES
   1. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.
   2. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi (24 kPa).

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry and not over-excavated. Do not install underground piping when bedding is wet or frozen.

B. Before commencing work, check final grade and pipe invert elevations required for drain terminations and connections to ensure proper slope.

3.02 PREPARATION

A. Ream pipes and tubes. Remove burrs, scale and dirt, inside and outside, before assembly. Remove foreign material from piping.

B. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. General

   1. Care shall be exercised to avoid all cross connections and to construct the plumbing systems in a manner which eliminates the possibility of water contamination.

   2. Install all materials and products in accordance with manufacturer's published recommendations. Use tools manufactured for the installation of the specific material or product.

   3. Heat generated by soldering procedures shall not be transmitted to valves, copper alloy roll groove fittings, copper press fittings, no-hub clamps, or any other components installed within the piping system that may be damaged due to high temperatures. Contractor shall take all precautions necessary, including utilizing wet wrapping or allowing heated piping to cool to ambient temperature before attachment.

   4. Pipe joints, no-hub clamps, flanges, unions, etc., shall not directly contact or be encased in concrete, or be located within wall, floor or roof penetrations.

   5. Route piping in direct orderly manner and maintain proper grades. Installation shall conserve headroom and interfere as little as possible with use of spaces. Route exposed piping parallel to walls. Group piping whenever practical at common elevations.

   6. Install piping to allow for expansion and Contraction without stressing pipe, joints or connected equipment.

7. Furnish all supports required by the piping included in this specification section.

8. Penetrations through fire rated walls, floors and partitions shall be sealed to provide a U.L. rating equal to or greater than the wall, floor or partition.

9. Seal all penetrations through floors, exterior building walls and grade beams air and water tight.

10. Each plumbing pipe projecting through roof shall be installed in accordance with Contract Specifications and Drawings. Penetrations shall be sealed air and water tight. Refer to details on Contract Drawings and coordinate with General Contractor for flashing requirements.

11. Furnish and install all necessary valves, traps, gauges, strainers, unions, etc. for each piece of equipment (including Owner furnished equipment) having plumbing connections, to facilitate proper functioning, servicing and compliance with code.

12. Provide code-approved transition adapters when joining dissimilar piping materials. Adaptors installed shall be manufactured specifically for the particular transition.

13. All piping shall have reducing fittings used for reducing or increasing where any change in the pipe sizes occurs. No bushing of any nature shall be allowed in piping.

14. Bury outside water and drainage pipe minimum one foot below recorded frost depth.

15. Buried piping shall be supported throughout its entire length.

16. All excavation required for plumbing work is the responsibility of the plumbing Contractor and shall be done in accordance with Contract Documents.

17. Piping shall be insulated in accordance with Contract Documents.

18. Provide clearance for installation of insulation and for access to valves, air vents, drains, unions, etc.

19. Provide dielectric isolation device where non-ferrous components connect to ferrous components. Devices shall be dielectric union, coupling or dielectric flange fitting.

20. All piping shall be isolated from building structures, including partition studs, to prevent transmission of vibration and noise.

21. Isolate all bare copper pipe from ferrous building materials. “Tape is not an acceptable isolator.

D. Drainage and Vent Systems

1. Slope drainage lines uniformly at 1/4" per foot, for lines 3" and less, and 1/8" per foot for larger lines, unless noted otherwise on Contract Drawings. Maintain gradients through each joint of pipe and throughout system.

2. Buried pipe shall be laid on a smoothly graded, prepared subgrade soil foundation true to alignment and uniformly graded. Bell holes shall be hand-excavated so that the bottom of the pipe is in continuous contact with the surface of the prepared subgrade material. Piping invert shall form a true and straight line.

3. The size of drainage piping shall not be reduced in size in the direction of flow. Drainage and vent piping shall conform to the sizes indicated on the Contract Drawings. Waste lines from water closets shall not be smaller than four inches. Under no circumstances shall any drain or vent line below slab be smaller than two inches.

4. Unburied horizontal cast iron soil piping shall be supported at least at every other joint except that when the developed length between supports exceeds four feet, they shall be provided at each joint. Supports shall also be provided at each horizontal branch connection and at the base of each vertical rise. Supports shall be placed immediately adjacent to the joint. Suspended lines shall be braced to prevent horizontal movement. Unburied vertical cast iron soil piping rising through more than one floor level shall be supported with riser clamps at each floor level.

5. Install couplings for hubless pipe and fittings in accordance with manufacturer's published recommendations. Use pre-set torque wrench and tighten band screws to 80 inch pounds minimum or as required by manufacturer’s published instructions.

6. All unburied change of direction fittings within the roof drainage system shall be braced against thrust loads that might result in joint separation due to dynamic forces caused by sudden, heavy rainfall conditions. Bracing shall incorporate galvanized steel pipe clamps and tie rods.

7. Provide cleanouts within sanitary waste systems at locations and with clearances as required by the code, at the base of each waste stack and at intervals not exceeding 75 feet in horizontal runs.

8. Provide cleanouts at the base of each vertical downspout and at intervals not exceeding 75 feet in horizontal building storm drain. Provide clearances as required by code. Horizontal roof drain piping located above building ground floor level will not require cleanouts.

9. A removable sink or lavatory p-trap with cleanout plug shall be considered as an approved cleanout for 2” diameter pipe.

10. All interior cleanouts shall be accessible from walls or floors. Provide wall cleanouts in lieu of floor cleanouts wherever possible. A floor cleanout shall be installed only where installation of a wall cleanout is not practical.

11. Provide a wall cleanout for each water closet or battery of water closets. Locate wall cleanouts above the flood level rim of the highest water closet but no more than twenty four inches above the finished floor.

12. Coordinate the location of all cleanouts with the architectural features of the building and obtain approval of locations from the Project Architect.

13. Lubricate cleanout plugs with anti-seize lubricant before installation. Prior to final completion, remove cleanout plugs, re-lubricate and reinstall using only enough force to provide a water and gas tight seal.

14. Install trap primer supply to floor drains, hub drains and floor sinks that are susceptible to trap seal evaporation and where indicated on Project Drawings. Primer unit installation shall comply with manufacturer's published recommendations. Trap primer lines shall slope to drain at a minimum ¼” per foot.

15. Capped waste and vent connections for future extensions shall be located accessibly and not extend more than 24” from active main. Waste connections and vent connections shall be located at elevations that will allow future installation of properly sloped piping without the need to dismantle or relocate installed ductwork, piping, conduit, light fixtures, etc.

16. Unless indicated otherwise within Contract Documents, all sanitary vent pipes passing through the roof shall be provided with lead roof flashings constructed of 2-1/2 pound sheet lead with bases extending no less than ten inches on each side of the pipe. The vertical portion of the flashing shall extend upward the entire length of pipe and be turned tightly inside the pipe at least two inches and shall not reduce the inside diameter of vent pipe more than the thickness of the flashing. Lead flashings shall be furnished by Plumbing Contractor and turned over to Roofing Contractor for installation.

17. Locate all sanitary vent terminals a minimum of 25 feet horizontally from or 3 feet vertically above all air intakes, operable windows, doors and any other building openings.

18. Wastewater when discharged into the building drainage system shall be at a temperature not higher than 140°F. When higher temperatures exist, approved cooling methods shall be provided.

E. Domestic Water System

1. On each water supply line serving a plumbing fixture, item of equipment, or other device which has a water supply discharge outlet below the overflow rim, or where cross contamination may occur, provide and install an approved vacuum breaker or backflow preventer. Installation of vacuum breakers shall prevent any possible backflow through them.

2. Provide thrust blocking and clamps for mechanical joint or gasketed underground water pipe at fittings with 3/4" rods, and properly anchor and support. Restraining rods, clamps and hardware shall be thoroughly coated with bituminous material to prevent corrosion.

3. Copper piping shall be supported at no greater than six foot intervals for piping 1-1/2" and smaller and ten foot intervals for piping 2" and larger in diameter.

4. Install all water piping to allow all piping within the system to be drained at low points.

5. Air chambers, dead-legs, or any other piping arrangement that may allow water to stagnate shall not be installed within domestic water systems. Valves installed for future connections shall not extend more than 24” from an active main.

6. Provide manufactured water hammer arrestors in water supply lines as indicated on Contract Drawings and in accordance with Standard PDI-WH201.

7. Pipe insulation shall be applied over installed freeze protection heat tracing tape.

8. Install union type fitting downstream of isolation valves at equipment connections.

9. Solder joint fittings shall not be installed within 24" of a copper press fitting.

10. Threaded adaptors shall be of the same manufacture and type as the system’s copper fittings.

11. Threaded adaptors on supply stub-outs shall be installed prior to construction of wall and shall not extend more than 1” beyond wall face.

12. Identify piping utilizing copper press fittings in accordance with project specification section 20 05 53.

F. Domestic Water Valves

1. Domestic water shut-off valves shall be installed where shown on Drawings, at each fixture and piece of equipment, at each branch take-off from mains, at the base of each riser, and at each battery of fixtures.

2. Install shut-off valves in accessible locations. Provide access panels where valves would otherwise be inaccessible. Coordinate quantity, size and location requirements of access panels with General Contractor.

3. Install shut-off valves with stems upright or horizontal, not inverted.

4. Where threaded valves are installed in copper piping systems special care shall be taken to avoid damaging the valve or its parts due to overheating. Install copper or bronze male adapters in each inlet of threaded valves. Sweat solder adapters to pipe prior to connecting to valve body.

5. Provide spring loaded type check valves on discharge of water pumps.

6. Provide accessible check valves in the individual cold and hot water fixture supply lines serving mixing valve type faucets or assemblies having hose connection outlets that are not equipped with integral check stops.

7. Install domestic hot water return circuit balancing valves where indicated on Contract Drawings and locate a minimum of five pipe diameters downstream and three pipe diameters upstream of all fittings and/or line shut-off valves. Location of valves shall allow unobstructed access for monitoring and adjustment.

8. Adjust and set domestic hot water return circuit balancing valves to flows indicated on Contract Drawings and in accordance with valve manufacturer's published instructions. Use flow meter recommended by valve manufacturer.

9. Provide a temperature gauge, strainer, union and line shut-off valve upstream of each hot water return circuit balancing valve.

3.04 TESTING

A. General

1. Equipment, material, power, and labor necessary for the cleaning, flushing, sterilization, inspection and testing of systems covered within this Specification Section shall be furnished by the Plumbing Contractor. All testing and inspection procedures shall be in accordance with Division 1 and Special Condition requirements of this Contract.

2. All new and parts of existing altered, extended, or repaired plumbing system piping shall be tested and inspected for leaks and defects. Piping being tested shall not leak nor show any loss in test pressure for duration specified.

3. In cases of minor installation and repairs where specified water and/or air test procedures are deemed impractical, Contractor shall obtain written approval from Owner's Representative to perform alternate testing and inspection procedures. Alternate testing and inspection procedures for minor installation and repairs shall include visual evaluation of installed components by Owner's Representative during a simulation of use.

4. The water utilized for tests shall be obtained from a potable source of supply.

5. Prepare testing reports. If testing is performed in segments, submit separate report for each segment, complete with diagram or clear description of applicable portion of piping. After inspection has been approved or portions thereof, certify in writing the time, date, name and title of the persons reviewing the test. This shall also include the description of what portion of the system has been approved. Obtain approval signature by Owner's Representative. A complete record shall be maintained of all testing that has been approved, and shall be made available at the job Site. Upon completion of the work, all records and certifications approving testing requirements shall be submitted to the Owner's Representative before final payment is made.

6. Verify systems are complete, flushed and clean prior to testing. Isolate all equipment subject to damage from test pressure. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. Leave piping uninsulated, uncovered and unconcealed until it has been tested and approved. Where any portion of piping system must be concealed before completion of entire system, the portion shall be tested separately as specified for the entire system prior to concealment. Contractor shall expose all untested covered or concealed piping.

7. Gauges used for testing shall have increments as follows:

    a. Tests requiring a pressure of 10 psi or less shall utilize a testing gauge having increments of 0.10 psi or less.

    b. Tests requiring a pressure of greater than 10 psi but less than or equal to 100 psi shall utilize a testing gauge having increments of 1 psi or less.

    c. Tests requiring a pressure of greater than 100 psi shall utilize a testing gauge having increments of 2 psi or less.

8. Separately test above and below ground piping.

9. Do not introduce test water into piping systems when exposure to freezing temperatures is possible.

10. Do not introduce test water into sections of piping located above existing sensitive areas and/or equipment that may be damaged or contaminated by water leakage. Coordinate with Owner's Representative to determine areas and/or equipment considered as being sensitive.

11. Defective work or material shall be reworked and replaced, and inspection and test repeated. Repairs shall be made with new materials. Pipe dope, caulking, tape, dresser couplings, etc., shall not be used to correct deficiencies.

12. The Contractor shall be responsible for cleaning up any leakage during flushing, testing, repairing and disinfecting to the original condition any building parts subjected to spills or leakage.

B. Drainage and Vent System

1. Subject gravity drainage and vent piping and joints to a vertical water column pressure of at least ten feet. If after 12 hours the level of the water has been lowered by leakage, the leaks must be found and stopped and the water level shall again be raised to the level described and the test repeated until, after a 12 hour retention period, there shall be no perceptible lowering of the water level in the system being tested. EXCEPTION: Portions of drainage and vent piping located on uppermost level of building shall be subjected to a water column pressure created by filling the system to point of overflow at roof vent terminals and roof drains. The pipes for the level being tested shall be filled with water to a verifiable and visible level as described above and be allowed to remain so for 12 hours.

2. Piping located above sensitive areas and/or equipment that may be damaged or become contaminated due to test water leakage shall be tested with air. Isolate the test section from all other sections and slowly fill pipe with oil-free air until there is a uniform gauge pressure of 5 pounds per square inch (34.5 kPa) or sufficient pressure to balance a 10-inch (254 mm) column of mercury. The air pressure shall be regulated to prevent the pressure inside the pipe from exceeding 5.0 PSIG. This pressure shall be held for a test period of at least 15 minutes. Any adjustments to the test pressure required because of changes in ambient temperature or the seating of gaskets shall be made prior to the beginning of the test period.

3. Test forced (pumped) drainage piping by plugging the end of the piping at the point of connection with the gravity drainage system and applying a pressure of 5psi (34.5 kPa) greater than the pump rating, and maintaining such pressure for 15 minutes.

4. Should the completion of these tests leave any reasonable question of a doubt relative to the integrity of the installation, additional tests or measures shall be performed to demonstrate the reliability of these systems to the complete satisfaction of the Owner's Representative.

5. Test plugs must extend outside the end of pipe to provide a visible indication for removal after the test has been completed.

C. Domestic Water System

1. Subject piping system to a hydrostatic pressure of at least 125 pounds per square inch gauge, but not less than the operating pressure under which it is to be used, for a period of no less than 12 hours. During test period, all pipe, fittings and accessories in the particular piping system that is being tested shall be carefully inspected. If leaks are detected, such leaks shall be stopped and the hydrostatic test shall again be applied. This procedure shall be repeated until no leaks are detected for an entire 12 hour period. EXCEPTION: Piping located above sensitive areas and/or equipment that may be damaged or become contaminated due to test water leakage shall be tested with oil-free air in lieu of water.

2. After completion of the testing, all new and/or altered water piping systems shall be thoroughly sterilized with a solution containing not less than 50 parts per million of available chlorine. Do not exceed 150 parts per million at any time. Introduce chlorine into the supply stream at a rate sufficient to provide a uniform concentration throughout the system. All outlets shall be opened and closed several times. When the specified level of chlorine is detected at every outlet in the system, close all valves to prevent release of water from the system for 24 hours. At the completion of the 24 hour disinfection period, test every outlet for a minimum chlorine residual of fifty parts per million. This minimum residual must be present to proceed with flushing. Flush the system with clean water at a sufficient velocity until the residual chlorine detected at every outlet is within 0.2 parts per million of the normal water supply's level.

3. Sufficient samples must be taken no sooner than 24 hours after sterilization and flushing to represent the extent and complexity of the affected water system, along with a control sample to indicate municipal water quality at the time of testing. Send water samples to an accredited laboratory to perform qualitative and quantitative bacteriological analysis in accordance with AWWA C651. Contractor shall obtain written certification from the independent testing agency stating that the water samples meet Federal and State guidelines for safe drinking water. Upon satisfactory completion of all procedures, and receipt of acceptable laboratory test results, obtain written approval by Owner's representative. Failure to fully comply with the above procedures will result in a requirement to repeat the procedure until acceptable results are achieved, at no additional cost to the Owner.

4. Isolate or bypass equipment that would be detrimentally affected by disinfecting solution. Isolate all other sections of the domestic water system not being disinfected to prevent migration of chlorine.

5. Prior to injection of chlorine into the piping system, strategically place signs stating "Heavily Chlorinated Water - Do Not Drink", and protect all outlets to prevent use during disinfection and flushing procedures.

D. A bacteria test is not necessary for small scale work. However, disinfection is required. Examples of small scale work are less than 20 feet of pipe, replacement and/or installation of a sink, drinking fountain, eyewash, backflow preventer, isolation valve, etc. Disinfect individual parts, fixtures, isolation valves, pipes, etc. by swabbing with full strength bleach (5.25%) or soaking for at least 30 minutes in a 500 ppm chlorine solution. The 500 ppm solution can be made by adding one part 5.25% bleach (household bleach) to 100 parts drinking water. For example 3-1/2 ounces of bleach can be added to 2-1/2 gallons drinking water. Materials should then be thoroughly rinsed before putting into service.

END OF SECTION 22 10 00

SECTION 221013 - PLUMBING SPECIALTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. Provide all materials and installation for plumbing specialties within building domestic water, sanitary waste and storm drainage systems; floor drains, floor sinks, hub drains, roof drains, cleanouts, backflow preventers, vacuum breakers, pressure regulating valves, water hammer arrestors, wall hydrants, hose bibbs, trap primer units, strainers, temperature gauges, pressure gauges and other normal parts that make the systems complete, operable, code compliant and acceptable to the authorities having jurisdiction.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. International Plumbing Code.

2. ANSI/NSF Standard 61 - Drinking Water System Components - Health Effects.

1.04 QUALITY ASSURANCE

1. Manufacturer’s name and pressure rating shall be permanently marked on valve body.

2. All materials shall be new, undamaged, and free of rust. Protect installed products and associated materials during progression of the construction period to avoid clogging with dirt, and debris and to prevent damage, rust, etc. Remove dirt and debris as work progresses.

3. Manufacturer Qualifications: Company shall have minimum three years documented experience specializing in manufacturing the products specified in this section.

4. Installer Qualifications: Company shall have minimum three years documented experience specializing in performing the work of this section. Installation of plumbing systems shall be performed by individuals licensed by the Texas State Board of Plumbing Examiners as a Journeyman or Master Plumber. Installation may be performed by Apprentice Plumbers provided they are registered with the Texas State Board of Plumbing examiners and under direct supervision of a licensed plumber. All installation shall be supervised by a licensed Master Plumber.

1.05 LEED AND SUSTAINABILITY:

A. Product Data for Prerequisite WE 1: Documentation indicating flow and water consumption requirements.

B. Plumbing fixtures shall be Water Sense certified

1.06 SUBMITTALS

A. Product Data:

1. Provide Code and Standards compliance, component dimensions, service sizes and finishes.

B. Record Documents:

1. Manufacturer's certification documentation for backflow preventers.

2. Submit proposed location of access panels which vary from quantities or locations indicated on Contract Drawings.

3. Provide full written description of manufacturer's warranty.

4. Record actual locations of plumbing specialties installed.

C. Operation and Maintenance Data:

1. Include testing procedures for backflow preventers, adjustment procedures for water pressure regulating valves.

2. Include installation instructions, exploded assembly views. servicing requirements, inspection data, installation instructions, spare parts lists, replacement part numbers and availability, location and contact numbers of service depot, for all plumbing specialties installed

1.07 DELIVERY, STORAGE AND HANDLING

A. Accept specialties on site in shipping containers and maintain in place until installation.

B. Provide temporary protective coating and end plugs on valves not packaged within containers. Maintain in place until installation.

C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work and isolating parts of completed system.

D. Protect all materials before and after installation from exposure to rain, freezing temperatures and direct sunlight. EXCEPTION: Materials manufactured for installation within exterior environments.

1.08 EXTRA MATERIALS

A. Provide two loose keys for each type of wall hydrant box.

B. Provide manufacturer's standard test kit for each type of backflow preventer installed.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Provide plumbing specialties as indicated and scheduled on the Contract Drawings and as specified herein. All materials and work shall meet or exceed all applicable Federal and State requirements and conform to adopted codes and ordinances of authorities having jurisdiction.

C. Pressure and temperature ratings of plumbing specialties shall be suitable for the anticipated system pressures and temperatures in which they are installed.

D. All materials within domestic water distribution systems that may come in contact with the potable water delivered shall comply with ANSI/NSF Standard 61.

E. All brass and bronze plumbing specialties within domestic water distribution systems that may come in contact with the potable water delivered shall have no more than 15% zinc content.

F. Specialties of same type shall be product of one manufacturer.

2.02 ACCEPTABLE MANUFACTURERS

A. Floor Drains:

B. Floor Sinks:

C. Roof Drain:

D. Wall/Floor Cleanouts:

E. Backflow Preventers and Vacuum Breakers: Watts Regulator, Febco, Conbraco.

F. Water Pressure Regulating Valves: Wilkins,

G. Water Hammer Arrestors:

H. Wall Hydrants:

I. Hose Bibbs:

J. Trap Primer Units:

K. Strainers:

L. Temperature Gauges:

M. Pressure Gauges:

2.03 FLOOR DRAINS (FD)

A. All floor drains shall be furnished and installed with all options and accessories required for a waterproof installation within the particular construction in which they are to be mounted.

B. Each floor drain shall be provided with a trap primer unless noted otherwise.

C. Floor drains installed for general floor area drainage within toilet rooms and other finished spaces shall have cast iron body with flange, adjustable top and sediment bucket, integral reversible clamping collar, seepage openings, 1/2" plugged primer tap, and 6” diameter nickel bronze or stainless steel strainer with vandal proof screws.

D. Floor drains installed for general floor area drainage and light to medium flow indirect equipment discharge within mechanical rooms shall have cast iron body with plugged 1/2" primer tap, integral clamping collar, seepage openings, adjustable top and 11-1/2” diameter ductile iron loose set tractor grate.

E. Floor drains installed for non-monolithic shower stall floors shall have cast iron body with flange, adjustable top and sediment bucket, integral reversible clamping collar, seepage openings and 5” diameter nickel bronze or stainless steel strainer with vandal proof screws.

F. All floor drains shall be as sized and scheduled on Contract Drawings.

2.04 FLOOR SINKS (FS)

A. All floor sinks shall be furnished and installed with all options and accessories required for a waterproof installation within the particular construction in which they are to be mounted.

B. Each floor sink shall be provided with a deep-seal p-trap unless noted otherwise.

C. Floor sinks installed for general floor area drainage shall have 8” round cast iron body with 3" sump, acid resistant enamel interior, aluminum dome strainer, seepage flange, membrane clamping device and 7-3/8” diameter stainless steel or nickel bronze top.

D. Floor sinks installed to receive indirect equipment discharge shall have cast iron 12" square body with 8" sump, acid resistant enamel interior, aluminum dome strainer, seepage flange, membrane clamping device and stainless steel top. Top shall be ½ or ¾ grate as scheduled on Drawings.

E. All floor sinks shall be as sized and scheduled on Contract Drawings.

2.05 HUB DRAINS (HD)

A. Hub drains shall be cast iron soil pipe hubs or hub adapters set with top of hub one-half inch (1/2”) above finished floor. Each hub drain shall be provided with a trap primer.

2.06 ROOF DRAINS (RD)

A. Primary roof drains shall be furnished and installed with all options and accessories required for a waterproof installation within the particular construction in which they are to be mounted and have lacquered cast iron body with sump, removable cast iron or bronze dome strainer, flashing flange and clamp, gravel stop, deck clamp and drain receiver. Provide extension where required.

B. Secondary (emergency overflow) roof drains shall be furnished and installed with all options and accessories required for a waterproof installation within the particular construction in which they are to be mounted and have minimum 2” high water dam, acid resistant epoxy coated cast iron body and sump, removable bronze dome strainer, flashing flange and clamp, gravel stop, deck clamp and drain receiver. Provide extension where required.

C. Roof drains shall be sized as indicated on Contract Drawings.

2.07

2.08 CLEANOUTS:

A. Cleanouts shall be the same nominal size as the pipe they serve up to four inches. For pipes larger than four inches nominal size, the size of cleanouts shall be six inches.

B. Cleanouts shall have cast iron body with tapered cast brass or bronze plug providing gas and watertight seal.

C. Interior floor cleanouts shall have stainless steel or nickel bronze scoriated top. Provide carpet marker when installed in areas to be covered by carpet.

D. Exterior cleanouts at grade shall have scoriated cast iron top.

E. Wall cleanouts shall be provided with stainless steel access covers of adequate size to allow rodding of drainage system. Wall cleanouts incorporating cover screws that extend completely through the access plug are not acceptable.

2.09 BACKFLOW PREVENTERS (INCLUDES BACKPRESSURE AND BACKSIPHONAGE)

A. Reduced Pressure Zone Type (Not For Use In Fire Protection Water Supply):

1. The assembly shall meet the requirements of ASSE 1013, AWWA C511.

2. The assembly shall consist of a pressure differential relief valve located in a zone between two positive seating check valves and captured springs. Backsiphonage protection shall include provision to admit air directly into the reduced pressure zone via a separate channel from the water discharge channel. The assembly shall include two tightly closing shutoff valves before and after the valve and test cocks.

3. Test cocks

4. Seats: Bronze, removable and replaceable without removing valve from the line.

5. Checks: Independently operating.

6. Relief Valve: Independently operating, located between the two check valves.

7. Rated 175 psi maximum working pressure with continuous temperature range of 33 to 140°F.

8. Unit to be complete with vent-port funnel to maintain the air gap and to provide a drain connection point.

9. Sizes 1/4" and 1/2" - Bronze body, bronze strainer, upstream and downstream quarter-turn ball valves, union connections: Watts Regulator Company Series 009.

10. Sizes 3/4" through 2" - Bronze body, bronze strainer, upstream and downstream quarter-turn ball valves, union connections: Watts Regulator Company Series 919.

11. Sizes 2-1/2" through 10" - FDA epoxy coated cast iron body, FDA epoxy coated strainer, upstream and downstream OSY – UL/FM outside stem and yoke resilient seated gate valves, flange connections: Watts Regulator Company Series 909.

B. Double Check Valve Assembly (For Use In Fire Protection Water Supply):

1. The assembly shall meet the requirements of ASSE 1015, be U.L. classified and FM Approved.

2. Two independent tri-link check modules within a single housing

3. Sleeve access port

4. Four test cocks

5. Rated 175 psi maximum working pressure with continuous temperature range of 33 to 110°F.

6. Sizes 2-1/2" through 10" - Schedule 40 stainless steel body, upstream and downstream UL/FM outside stem and yoke resilient seated gate valves or UL/FM grooved gear operated butterfly valves with tamper switches: Watts Regulator Company Series 757.

2.10 WATER PRESSURE REGULATING VALVES

A. Low to Moderate Flow Systems (Less Than 70 GPM) and Individual Equipment

1. Sizes 1/2" through 2"
2. All bronze body
3. 0.25% maximum weighted average lead content
4. Integral stainless steel strainer screen
5. Built-in bypass check valve
6. FDA approved elastomers
7. Renewable seat
8. Union end connection
9. Rated for water temperature up to 180°F and minimum 300 psi inlet pressure. Provide model with inlet pressure rating, reduced pressure range and factory preset outlet pressure as scheduled on Contract Drawings.
10. Manufactured by Wilkins Series 600XL or approved equal by Watts.

B. Large Demand Systems

1. Sizes 1-1/4” through 2 - ASTM B62 bronze body
2. Sizes 2-1/2” and larger - ASTM A536 ductile iron body
3. Pressure reducing pilot control
4. Stainless steel disc guide, seat and bearing cover
5. Stainless steel stem, nut and spring
6. FDA approved Nylon reinforced Buna-N rubber diaphragm
7. Provide model(s) with size, temperature range, inlet pressure rating, reduced pressure range, outlet pressure and options as scheduled on Contract Drawings.
8. Cla-Val Company Series 90 or approved equal by Watts.
9.

2.11 WATER HAMMER ARRESTORS (SHOCK ABSORBERS):

A. Nesting type bellows operated water hammer arrestor with male N.P.T. connection. Bellows and body casing made of Type 304 stainless steel. Water hammer arrestors shall be certified to the PDI WH-201 Standard and ASSE Standard 1010.

B. Arrestors shall be designed and manufactured for a maximum working temperature of 250F and maximum operating pressure of 125 P.S.I.G.

C. All arrestors shall be designed and approved for sealed wall installation without an access panel.

D. Water hammer arrestors shall be sized according to water hammer arresters standard PDI-WH-201 and as indicated on Contract Drawings.

2.12 WALL HYDRANTS (WH)

A. Provide antisiphon, non-freeze wall hydrant with brass casing, integral backflow preventer, vandalproof box with loose-key handle and finish as scheduled on Drawings.

2.13 HOSE BIBBS (HB)

A. General Areas: Provide Chicago Faucet No. 387 chrome plated brass hose bibb with ¾-inch female inlet, wall flange, tee handle and No. E27 vacuum breaker.

B. Housekeeping Mop Sinks: Provide Chicago Faucet No. 293-369COLDCP chrome plated brass hose bibb with ¾-inch female inlet, wall flange and lever handle.

2.14 TRAP PRIMER UNITS (TP)

A. Trap Priming devices that rely upon line pressure differential for activation are not allowed.

B. Electronic Trap Primers:

1. Provide model with quantity of outlets and type of mounting box as scheduled on Contract Drawings.

2. The number of traps served by a single trap priming device shall not exceed the number of header outlets provided within the device. Auxiliary distribution units are not allowed.

3. All unused header outlets shall be capped water-tight with compatible threaded fittings.

4. Each electronic trap primer device shall be provided with a readily serviceable strainer immediately upstream of the device solenoid valve.

5. Electronic trap primers shall provide 10 second water injection to traps every twenty-four hours, complete with galvanized steel box and cover, copper inlet connection, brass ball type stop valve, slow closing 24 VAC solenoid valve with integral strainer, 120-24 VAC transformer, brass atmospheric vacuum breaker, and copper waterway.

6. Electronic trap primers shall be manufactured by Zurn Z1020-CW or approved equal by Precision Plumbing Products “Prime Time”, model to suit installation.

C. Trap Primer for use with Lavatory or Sink Drain Tailpiece:

1. This type of device shall not serve more than one trap.

2. Polished Chrome Plated Cast Bronze P-trap with Ground Joint Outlet.

3. Threaded Wall Tube, Slip Joint Nuts, Washers and Escutcheons.

4. 1/2" Polished Chrome Plated Bronze Primer Tube with Compression Fitting Connection at Wall.

5. Jay R. Smith Model 2698 or approved equal of a referenced acceptable manufacture.

2.15 TEMPERATURE GAUGES:

A. Thermometers shall be vapor or liquid actuated, direct-mounted, universal adjustable angle dial type with stainless steel or cured polyester powder coated cast aluminum case, stainless steel friction ring and glass window. Dial face shall be white with black figures; pointer shall be friction adjustable type. Movement shall be brass with bronze bushings. Bourdon tube shall be phosphor bronze with a brass socket.

B. Thermometer range shall be 30 - 240° Fahrenheit and have an accuracy of ±1 scale division.

C. Dial face shall be 4½” diameter where installed within eight feet of floor level and 6” diameter where installed higher than six feet above floor level. Provide remote read-out gauges for isolated or hard to access monitoring points.

D. Provide a brass or stainless steel separable thermowell for each thermometer.

E. Thermometers shall have a sensing bulb with an insertion length of roughly half of the pipe diameter; minimum insertion length shall be 2". Thermometers installed on tanks shall have a minimum insertion length of 5".

F. Where insulation thickness exceeds 2", provide proper bulb length and an extension neck separable thermowell. The extension neck shall be at least 2" long.

2.16 PRESSURE GAUGES:

A. Gauges shall comply with ASME B40.1, Grade 2A, and have ±0.5 percent of full scale accuracy, with type 304 stainless steel or aluminum case, bronze wetted parts and brass socket. Dial face shall be 3½” diameter where installed within six feet of floor level and 6” diameter where installed higher than eight feet above floor level. Dial face shall be aluminum with white background, black graduations and black markings. Pointer shall be adjustable with black finish. Provide remote read-out gauges for isolated or hard to access monitoring points.

B. Units of measure shall be in pounds per square inch (psi). The proper range shall be selected so that the average operating pressure falls approximately in the middle of the scale selected.

C. All pressure gauges shall be equipped with brass or stainless steel needle valves and pressure snubbers.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate cutting and forming of roof and floor construction to receive drains with General Contractor.

B. Verify location of equipment and housekeeping pads prior to installation of floor drains. Relocation due to misplacement shall be at Contractor’s expense.

3.02 INSTALLATION

A. General

1. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

2. Install plumbing specialties in accordance with manufacturer’s published instructions.

B. Drains and Cleanouts

1. Extreme care shall be used to set the top elevation of floor drains and floor sinks to meet the low point elevation of the finished floor.

2. Pipe connections to roof drains, above grade floor drains and floor sinks shall not directly contact or be encased in concrete.

3. Final mounting of interior cleanout top or access cover shall be set flush with the finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil.

4. Encase exterior cleanouts within 14” x 14” x 6” thick reinforced concrete pad. Set top flush with finished grade surface.

5. Locate cleanouts with required clearance for rodding of drainage system.

C. Backflow Preventers and Vacuum Breakers

1. Isolate all non-potable water requirements from the building domestic water system with backflow prevention device manufactured and certified for the particular application.

2. Pipe relief from backflow preventer indirectly to drain of sufficient size to evacuate maximum flow discharge.

3. Backflow preventers shall be duplexed full-size where located within domestic water lines serving in-patient areas, critical research areas, and/or any area or equipment where un-interruptible (24 hour) water service is required.

4. Backflow preventer test ports shall not be located more than 72 inches above finished floor or permanent platform.

5. Do not install vacuum breakers above equipment, above ceilings, concealed within walls, or areas where water leakage can cause damage.

D. Water Hammer Arrestors (Hydraulic Shock Absorbers)-

1. Provide hydraulic shock absorbers in cold and hot water supply lines to each fixture branch, battery of fixtures and at each automatic, solenoid-operated or quick-closing valve serving equipment.

2. Locate and size hydraulic shock absorbers in accordance with PDI-WH-201 Standard and manufacturer’s published recommendations.

E. Water Pressure Regulating Valves

1. Provide isolation valve, strainer and pressure gauge immediately upstream of each pressure regulating valve.

2. Provide pressure gauge and isolation valve immediately downstream of each pressure regulating valve.

3. Installation shall allow sufficient access to and space around components for adjustments and servicing.

4. Provide services of a direct factory representative for start-up service, inspection and necessary adjustments for all large demand regulators.

END OF SECTION

SECTION 222023 – NATURAL GAS PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 & Division 20 Specification Sections, apply to this Section.

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. This section covers the complete first-class natural gas system installation, within and to five (5) feet beyond building perimeter unless noted otherwise on Contract Drawings, including but not limited to piping, regulators, unions, valves, installation, testing and other normal parts that make the systems complete, operable, code compliant and acceptable to the authorities having jurisdiction.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. International Fuel Gas Code 2015

2. Uniform Plumbing Code 2015

3. Latest Edition of NFPA 54, National Fuel Gas Code.

4. Minimum Safety Standards for Natural Gas, 49 Code of Federal Regulations (CFR) Part 192, as Required by Title 16 of the Texas Administration Code § 8.70.

1.04 QUALITY ASSURANCE

A. All materials, equipment and Work shall meet or exceed all applicable federal, state and local requirements and conform to codes and ordinances of authorities having jurisdiction.

B. Valves: Manufacturer’s name, size, standards compliance and pressure rating clearly marked on outside of valve body.

C. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

D. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

E. Installer Qualifications: Company specializing in performing the Work of this Section with minimum three (3) years documented experience. Installation of natural gas systems shall be performed by individuals licensed by the Texas State Board of Plumbing Examiners as a Journeyman or Master Plumber. All installation shall be supervised by a licensed Master Plumber. All testing shall be performed by a licensed Journeyman or Master Plumber. Welders shall be certified in accordance with ASME Section 9.

1.05 SUBMITTALS

A. Product Data:

1. Provide code and standards compliance verification, manufacturer's product data and ratings on pipe materials, pipe fittings, regulators, valves and accessories.

B. Record Documents:

1. Submit test reports and inspection certification for all-natural gas systems installed under this Contract.

2. Submit manufacturer's data reports for all material used in coating and wrapping.

3. Submit welder’s certifications prior to any shop or field fabrication. Welder’s certifications shall be current within six (6) months of submission.

4. Record actual locations of valves, regulators, etc. and prepare valve charts.

5. Provide full written description of manufacturer’s warranty.

C. Operation and Maintenance Data:

1. Include installation instructions, spare parts lists, exploded assembly views manufacturer’s recommended maintenance.

1.06 DELIVERY, STORAGE AND HANDLING

A. Accept valves on Site in shipping containers with labeling in place, inspect for damage and store with a minimum of handling. Store plastic piping under cover out of direct sunlight. Do not store materials directly on the ground.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work and isolating parts of completed system.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Natural gas pressures shall not exceed five (5) pounds per square inch gauge on customer side of the meter.

C. Pipe joint compound shall be lead-free, non-toxic, non-hardening, insoluble in the presence of natural gas and compliant with ANSI/NSF 61 and Federal Specification TT-S-1732. Temperature service range of -15 degrees F to +400 degrees F, manufactured by Hercules “MegaLoc” or approved equal by Rectorseal, La-Co or Oatey.

2.02 PIPING

A. Buried Piping Outside of Building:

1. Polyethylene, SDR-11, ASTM D2513 pipe and fittings with heat fusion socket joints.

2. Polyethylene pipe and fitting materials shall be compatible and by same manufacturer to ensure uniform melting and a proper bond. Fabricated fittings shall not be used.

3. Provide connection between buried plastic gas service piping and metallic riser in accordance with the gas code. Provide metallic riser consisting of HDPE fused coating on steel pipe for connection to above ground building distribution piping. Underground horizontal metallic portion of riser shall be at least twenty four inches in length before connecting to the plastic service pipe. An approved transition fitting or adaptor meeting design pressure rating and plastic pipe manufacturers recommendations shall be used where the plastic joins the metallic riser.

4. Piping between the building and pump (boiler) house shall be concrete encased or protected with thin layer of concrete.

B. Above Ground Piping Outside of Building (Including roof):

1. Piping 1½ inches and smaller shall be seamless Schedule 40 black steel, ASTM A106 or ASTM A53 Type "S", Grade A or B, with Class 150 black malleable iron threaded fittings conforming to ASME B16.3.

2. Piping 2 inches and larger shall be Type "S" seamless or Type "E" electric resistance welded Schedule 40 black steel, ASTM A53, Grade A or B, with Schedule 40 wrought carbon steel fittings, ASTM A 234 and butt weld joints.

3. Provide factory-applied, three-layer coating of epoxy, adhesive, and PE or field applied primer and epoxy paint coating on all pipe and fittings. Field applied coating is restricted to fittings and short sections of pipe necessarily stripped for threading or welding. Field coating shall be manufactured by Amercoat Type 240 or approved equal and applied in accordance with manufacturer's recommendations. Galvanizing shall not be considered adequate protection.

C. Above Ground Piping Exposed Inside of Building:

1. Piping 1½ inches and smaller shall be seamless Schedule 40 black steel, ASTM A106 or ASTM A53 Type "S", Grade A or B, with Class 150 black malleable iron threaded fittings conforming to ASME B16.3.

2. Piping 2 inches and larger shall be Type "S" seamless or Type "E" electric resistance welded Schedule 40 black steel, ASTM A53, Grade A or B, with Schedule 40 wrought carbon steel fittings, ASTM A 234 and butt weld joints.

3. EXCEPTIONS:

a. All exposed piping 1½ inches and smaller located within areas utilized as return air plenums shall have welded joints with Schedule 40 socket welded forged steel fittings conforming to ASME B16.11.

D. Above Ground Piping Concealed Inside of Building (Includes above all ceilings, within partitions, within chases, and all non-accessible locations):

1. Piping 1½ inches and smaller shall be seamless Schedule 40 black steel, ASTM A106 or ASTM A53 Type "S", Grade A or B, with welded joints with Schedule 40 socket welded forged steel fittings conforming to ASME B16.11.

2. Piping 2 inches and larger shall be Type "S" seamless or Type "E" electric resistance welded Schedule 40 black steel, ASTM A53, Grade A or B, with Schedule 40 wrought carbon steel fittings, ASTM A 234 and butt weld joints.

3. EXCEPTIONS:

   a. Threaded piping 1½ inches and smaller may be installed in lieu of welded provided that all piping is encased within steel sleeve vented to the exterior of the building. Sleeve piping shall be Schedule 10 black steel pipe conforming to ASTM A53, Grade A or B, electric resistance welded or seamless, with roll-grooved ends. Sleeve pipe couplings shall be Victaulic Style 75 with Grade T nitrile gasket. Sleeve fittings shall be Victaulic grooved malleable or steel. Sleeve piping and fittings must be two pipe sizes, but not less than 1 inch larger than encased gas piping.

2.03 VALVES

A. All valves shall be designed, manufactured and approved for natural gas service.

B. Line Shut-off Valves sizes 2 inches and smaller shall be iron body lubricated plug valve conforming to ASTM-A-126, U.L. Listed and A.G.A. Approved for natural gas service with threaded ends, wrench operation, rated for 200 WOG service pressure and –20 to 200 degrees F., manufactured by Resun Model R-1430 or Nordstrom Model 142.

C. Line Shut-off Valves sizes 2½ inches and larger shall be iron body lubricated plug valve conforming to ASTM-A-126, U.L. Listed and A.G.A. Approved for natural gas service with flanged ends, wrench operation, rated for 200 WOG service pressure and –20 to 200 degrees F., manufactured by Resun Model R-1431 or Nordstrom Model 143.

D. Appliance/Equipment Shut-off Valves at local connections sizes 2 inches and smaller shall be bronze body, full port ball or butterfly type, U.L. Listed and A.G.A. Approved for natural gas service with threaded ends, quarter turn lever handle operation, rated for 175 W.O.G. service pressure and 30 to 275 degrees F., manufactured by Nibco Model T585-70-UL, Model T580-70-UL or Milwaukee Model BB2-100.

E. Manual Emergency Shut-off Valves sizes 2 inches and smaller shall be bronze body, full port ball or butterfly type, U.L. Listed and A.G.A. Approved for natural gas service with threaded ends, quarter turn lever handle operation, rated for 175 W.O.G. service pressure and 30 to 275 degrees F., manufactured by Nibco Model T585-70-UL, Model T580-70-UL or Milwaukee Model BB2-100.

F. Automatic Emergency Shut-off Valves shall be U.L. Listed F.M. Approved for natural gas service, 2-way electrically tripped solenoid type; fail safe closed; manual reset; Type 1 solenoid enclosure; NBR seals and disc; stainless steel core tube and springs; copper coil; manufactured by ASCO Red Hat Series 8044 or approved equal.

2.04 GAS CUTOFFS:

A. On the inlet and discharge side of the meter and pressure regulators and at building entrance, install a wrench operated plug cock valve. The flanges of this stop valve shall be dimensioned, drilled, faced and spot faced to conform to the Class 125 American Standard for Cast Iron Flanges (B16.1-1948). Install zone valves on each floor accessible to occupants for shutting off areas of the building under emergency conditions. Gas piping shall be welded up to these zone valves.

2.05 PRESSURE REGULATORS

A. All pressure regulators shall be designed, manufactured and approved for natural gas service.

B. Pressure regulators for individual service lines shall be capable of reducing distribution line pressure to pressures required for users. Pressure relief shall be set at a lower pressure than would cause unsafe operation of any connected user. Regulator shall have a single port with orifice diameter no greater than that recommended by manufacturer for the maximum gas pressure at the regulator inlet. Regulator vent valve shall be of resilient materials designed to withstand flow conditions when pressed against valve port. Regulator shall be capable of limiting build-up of pressure under no-flow conditions to 50 percent or less of the discharge pressure maintained under flow conditions. Commercial grade diaphragm type with internal relief valve, vent valve, cast iron body, Buna-N diaphragm. Manufactured by Rockwell or Fisher.

C. Install pressure gauge adjacent to and downstream of each line pressure regulator.

2.06 DRIP PIPES:

A. Drip pipes shall be provided throughout the gas piping systems for the purpose of accumulating moisture and condensate. They shall be sized no smaller than the gas piping to which they are connected in each instance. These drip pipes shall be U-shaped providing an effective water seal of no less than twelve inches (12") of water. The extremity of each U-shaped drip pipe shall be threaded and capped with a suitably sized, screwed pattern, black, standard weight, malleable iron cap.

B. All drip pipes shall be located in an accessible position so that the condensate may either be pumped from the system or so that a water seal shall be provided in the event that the water forming the seal evaporates.

2.07 UNIONS

A. Unions in 2 inches and smaller in ferrous lines shall be right and left hand nipple/coupling assembly, or ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends, 2-1/2 inches and larger shall be ground flange unions. Companion flanges on lines at various items of equipment, machines and pieces of apparatus may serve as unions to permit disconnection of piping.

B. Unions connecting ferrous pipe to copper or brass pipe shall be dielectric type.

C. Above grade flexible stainless steel appliance/equipment connectors shall conform with AGA under the ANSI Z21.69 Standard. Hose shall be braided stainless steel with a polyolefin heat-shrink tubing with high flame-retardant qualities. Hose shall be equipped with malleable iron unions and spring loaded brass quick-link couplings. An easily accessible manual shut-off valve shall be installed ahead of all hose connections. Specify T&S Brass "Safe-T-Link" or approved equal.

2.08 HEADERS:

A. The gas distribution header installed by this Contractor in the building shall be fabricated of Schedule 40 steel pipe. The pipe and welding materials for this header shall be carefully selected, and the welding operations shall be carefully supervised.

B. Welding nipples neatly aligned shall be provided for the outlets of the header. After the header has been completely fabricated, it shall be temporarily sealed and subjected to a pneumatic test pressure of 100 pounds per square inch. While the header is subjected to this pressure, all welded joints shall be given an application of soapy water for the purpose of detecting minute leaks which might not otherwise be observed. These leaks shall not be repaired by any peening operations. Such leaks shall be remedied by chipping and re-welding until the header is devoid of leaks at that pressure. The header shall then be subjected to a hydrostatic test pressure of 200 pounds per square inch. Under these circumstances, the test pressure of the water confined in the header shall not decrease in a four hour period of observation. If leaks are encountered, they shall be repaired and re-tested until proven tight.

C. The header shall be provided with a one-half inch (1/2") drain connection "taken off" the bottom of the header and terminated in a suitable stop cock. This one-half inch (1/2") drain connection shall have its origin in a 2" x 1/2" welding reducer having its two inch (2") end so welded to the header as to completely drain that member. Each outgoing branch from the header shall be provided with a gas stop valve of gas cock. The nature of the outgoing welding nipples shall be such that these cocks shall be aligned in a neat horizontal line.

2.09 FLANGES

A. All 150 lb. and 300 lb. ANSI flanges shall be domestically manufactured, weld neck forged carbon steel, conforming to ANSI B16.5 and ASTM A-181 Grade I or II or A-105-71. Slip on flanges shall not be used. Each fitting shall be stamped as specified by ANSI B16.9 and, in addition, shall have the laboratory control number stenciled on each fitting for ready reference as to physical properties and chemical composition of the material. Complete test reports may be required for any fitting selected at random. Flanges which have been machined, remarked, painted or otherwise produced domestically from imported forges will not be acceptable. Flanges shall have the manufacturer's trademark permanently identified in accordance with MSS SP-25. Contractor shall submit data for firm certifying compliance with these Specifications. Bolts used shall be carbon steel bolts with semi-finished hexagon nuts of American Standard Heavy dimensions. All thread rods will not be an acceptable for flange bolts. Bolts shall have a tensile strength of 60,000 psi and an elastic limit of 30,000 psi. Flat-faced flanges shall be required to match flanges on pumps, check valves, strainers, etc. Only one manufacturer of weld flanges will be approved for each project.

B. All flanges shall be gasketed. Contractor shall place gasket between flanges of flanged joints. Gaskets shall fit within the bolt circle on raised face flanges and shall be full face on flat face flanges. Gaskets shall be cut from 1/16 inch thick, non metallic, non asbestos gasket material suitable for operating temperatures from -150 degrees F to +75 degrees F, Klingersil C-4400, Manville Style 60 service sheet packing, or approved equal.

2.10 UNDERGROUND WARNING TAPE

A. Minimum 3 inch wide polyethylene detectable type marking tape. The tape shall be resistant to alkalis, acids and other destructive agents found in soil and impregnated with metal so that it can be readily recognized after burial by standard locating equipment.

1. Lamination bond of one (1) layer of Minimum 0.35 mils thick aluminum foil between two (2) layers of minimum 4.3 mils thick inert plastic film.

2. Minimum tensile strength: 63 LBS per 3 IN width.

3. Minimum elongation: 500 percent.

4. Provide continuous yellow with black letter printed message repeated every 16 to 36 inches warning of pipe buried below (e.g.: "CAUTION GAS LINE BURIED BELOW").

5. Manufactured by Reef Industries "Terra Tape" or approved equal.

PART 3 - EXECUTION

3.01 PREPARATION

A. Ream pipe ends and remove cutting burrs. Bevel plain end ferrous pipe.

B. Remove cutting oil, scale and dirt, on inside and outside of piping, before assembly.

3.02 EQUIPMENT CONNECTIONS

A. Provide specified connections, shutoff valves, regulators and unions at each and every appliance and piece of equipment requiring natural gas, including equipment furnished under other Divisions of these Specifications and/or by the Owner.

B. Provide and install union type connections at all equipment to permit removal of service piping.

C. Gas service connections shall have a diameter at least one pipe size larger than that of the inlet connection to the equipment as provided by the manufacturer and be of adequate size to provide the total input demand of the connected equipment.

D. Provide listed and labeled appliance connectors complying with ANSI Z21.69 and listed for use with food service equipment having casters, or that is otherwise subject to movement for cleaning, and other large movable equipment. Connectors shall have listed and labeled quick-disconnect devices and shall have retaining cables attached to structures and equipment. Connectors shall not be concealed within or extended through wall, floor or partition and shall be located entirely in the same room as the connected equipment. Provide an accessible shut-off valve not less than the nominal size of the equipment connector, immediately ahead of the connector.

E. Rigid metallic pipe and fittings shall be used at service connections to all stationary equipment.

3.03 FABRICATION METHODS:

A. All house piping must be securely fastened in place in such a manner as to maintain its grading. Under no circumstances shall extension bars be used for supporting gas piping. Under no circumstances shall any gas piping be used to support any weight other than its own weight.

B. All branch outlet pipes shall be taken from the top or sides of running horizontal lines and not from the bottom. No crosses shall be installed in any horizontal gas line. No unions, gas cocks, or valves shall be used in any concealed location. Every gas cock and valve shall be accessible for inspection and repair.

C. The general arrangement of all gas piping shall be such that the number of threaded joints involved is reduced to an absolute minimum. If obstructions are encountered, pipe shall not be bent to circumvent such obstructions. Welding fittings shall be used for this purpose in the case of welded lines, and if threaded lines are involved, screwed fittings shall be used. Wherever gas pipes run through outside brick, stone, or other walls, the opening around the pipe shall be securely and rigidly sealed. Gas pipe sizes shall be at least one pipe size larger than the inlet of the gas appliance which they supply. No bushings shall be used in conjunction with any gas piping.

3.04 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer’s published recommendations.

C. Provide support for and connections to natural gas service meter in accordance with requirements of the utility company.

D. All installation shall be in accordance with manufacturer’s published recommendations.

E. Distribution piping shall be as short and as direct as practicable between the point of delivery and the outlets.

F. All excavation required for plumbing work is the responsibility of the Plumbing Contractor and shall be done in accordance with project Specifications.

G. Do not install underground piping when bedding is wet or frozen.

H. Bury all underground piping at least 3 feet below finished grade. Provide a continuous detectable warning tape on tamped backfill, 12 inches above all buried non-metallic gas lines.

I. Do not install gas piping in the same trench with other utilities. The minimum horizontal clearance between gas pipe and parallel utility pipe shall be 2 feet. Do not install gas pipe through catch basins, vaults, manholes or similar underground structures.

J. Install and support all polyethylene piping in accordance with manufacturer's recommendations. All heat fusion welds shall be performed by welders qualified to the manufacturer’s procedures.

K. Polyethylene piping shall not be installed above ground.

L. Provide connection between buried plastic gas piping and metallic riser in accordance with the gas code.

M. All above ground gas piping shall be electrically continuous and bonded to electrical system ground conductor in accordance with NFPA 70.

N. Provide and install union type fittings at proper points to permit dismantling or removal of pipe. No unions will be required in welded lines except at equipment connections. Where union type fittings are necessary for piping dismantling purposes, right and left nipples and couplings shall be used. Flanges, ground-joint unions or approved flexible appliance connectors may be used at exposed fixture, appliance or equipment connections.

O. Provide dielectric isolation device where copper lines connect to ferrous lines or equipment, such as dielectric coupling or dielectric flange fitting.

P. Valves, regulators, flanges, union type fittings and similar appurtenances shall be accessible for operation and servicing and shall not be located above ceilings, within chases, walls/partitions, spaces utilized as return air plenums or non-accessible locations.

Q. Route piping in orderly manner and maintain gradient. Install piping to conserve building space. Group piping whenever practical at common elevations.

R. Install piping to allow for expansion and Contraction without stressing pipe, joints, or connected equipment.

S. Make service connections at the top of the main, whenever the depth of the main is sufficient to allow top connections. When service connections cannot be made at the top of the main, they shall be made on the side of the main no lower than the horizontal midpoint of the gas main.

T. Cross type fittings shall not be installed in any gas line. Bushings shall not be used in conjunction with any gas piping.

U. Slope piping and arrange to drain at low points. Install drip/sediment traps at points where condensate and debris may collect. Locate drip/sediment traps where readily accessible for cleaning and emptying. Do not install where condensate would be subject to freezing. Construct drip/sediment traps using tee fitting with capped nipple connected to bottom outlet. Use minimum-length nipple of 3 pipe diameters, but not less than 4 inches long, and same size as connected pipe. Cap shall be screwed pattern, black, standard weight, malleable iron. Install with adequate space for removal of cap.

V. Install valves for shut off and to isolate equipment, parts of systems, or vertical risers. All valves shall be located such that servicing and operation is possible. All flanged valves shown in horizontal lines with the valve stem shall be positioned so that the valve stem is inclined one bolt hole above the horizontal position. Screw pattern valves placed in horizontal lines shall be installed with their valve stems inclined at an angle of a minimum of 30 degrees above the horizontal position. All valves must be true and straight at the time the system is tested and inspected for final acceptance. Valves shall be installed as nearly as possible to the locations indicated in the Contract Drawings. Any change in valve location must be so indicated on the Record Drawings.

W. Install line shut-off valve at each branch connection to riser. Branch line shut-off valves shall be automatic type where indicated on Drawings.

X. Provide adequate clearance for access to and operation of all valves.

Y. Install valves with stems upright or horizontal, not inverted unless required otherwise by the valve manufacturer.

Z. Pipe vents from gas pressure reducing valves and pipe casing sleeves to the exterior of the building and terminated with outlet turned down and capped with corrosion resistant insect screen. Vent terminations shall be at least seven feet above grade or pedestrian traffic and a minimum three (3) feet above or twenty five (25) feet horizontally from all air intakes or building openings.

AA. Above ground horizontal natural gas and encasement piping shall be supported at intervals of no greater than 6 foot for 1/2 inch piping, 8 foot for 3/4 inch and 1 inch piping and 10 foot for 1-1/4 inches and larger piping. Vertical piping shall be supported at each floor level and at intervals as specified for horizontal piping.

BB. Extension bars shall not be used for supporting gas or encasement piping. Gas or encasement piping shall not be used to support any other piping or component.

CC. Identify piping and valves in accordance with Project Specification Section 20 05 53.

3.05 INSTALLATION OF WELDED PIPING

A. Welding of pipe in normally occupied buildings is prohibited. Off-Site welding is acceptable. Should welding be required in a normally occupied building for connecting to an existing welded system, obtain written approval from the Resident Construction Manager and comply with Owner's fire and life safety requirements.

B. Piping and fittings shall be welded and fabricated in accordance with ASME/ANSI the latest editions of Standard B32.1 for all systems from the Code for Pressure Piping. Machine beveling in shop is preferred. Field beveling may be done by flame cutting to recognized standards.

C. Ensure complete penetration of deposited metal with base metal. Provide filler metal suitable for use with base metal. Maintain inside of fittings free from globules of weld metal. All welded pipe joints shall be made by the fusion welding process, employing a metallic arc or gas welding process. All pipes shall have the ends beveled 37-½ inch degrees and all joints shall be aligned true before welding. Except as specified otherwise, all changes in direction, intersection of lines, reduction in pipe size and the like shall be made with factory-fabricated welding fittings. Mitering of pipe to form elbows, notching of straight runs to form tees, or any similar construction will not be permitted.

D. Align piping and equipment so that no part is offset more than 1/16 inch. Set all fittings and joints square and true and preserve alignment during welding operation. Use of alignment rods inside pipe is prohibited.

E. Contractor shall not permit any weld to project within the pipe so as to restrict it. Tack welds, if used, must be of the same material and made by the same procedure as the completed weld. Otherwise, remove tack welded during welding operation.

F. Do not split, bend, flatten or otherwise damage piping before, during or after installation.

G. Remove dirt, scale and other foreign matter from the inside of piping, by swabbing or flushing, prior to the connection of other piping sections, fittings, valves or equipment.

H. In no cases shall Schedule 40 pipe be welded with less than three passes including one stringer/root, one filler and one lacer. Schedule 80 pipe shall be welded with not less than four passes including one stringer/root, two filler and one lacer. In all cases, however, the weld must be filled before the cap weld is added.

I. Weld Testing:

1. All welds are subject to inspection, visual and/or x-ray, for compliance with Specifications. The Owner will at the Owner's option, provide employees or employ a testing laboratory for the purposes of performing said inspections and/or x-ray testing. Initial visual and x-ray inspections will be provided by the Owner. The Contractor shall be responsible for all labor, material and travel expenses involved in the re-inspection and retesting of any welds found to be unacceptable. In addition, the Contractor shall be responsible for the costs involved in any and all additional testing required or recommended by ASME/ANSI Standards B31.1 and B31.3 due to the discovery of poor, unacceptable or rejected welds.

2. Welds lacking penetration, containing excessive porosity or cracks, or are found to be unacceptable for any reason, must be removed and replaced with an original quality weld as specified herein. All qualifying tests, welding and stress relieving procedures shall, moreover, be in accord with Standard Qualification for Welding Procedures, Welders and Welding Operators, Appendix A, Section 6 of the Code, current edition.

3.06 TESTING

A. All natural gas systems shall be inspected, tested, purged and placed into operation in accordance with NFPA 54 and as required herein.

B. All natural gas piping systems shall be very carefully inspected, tested, purged and placed into operation by a Licensed Plumber.

C. All necessary apparatus for conducting tests shall be furnished by the Contractor and comply with the requirements of NFPA 54.

D. All new rough-in distribution piping and affected portions of existing systems connected to, shall be subjected to a pneumatic test pressure utilizing clean, dry air and must be demonstrated to be absolutely tight when subjected to the pressures and time durations listed herein. All equipment and components designed for operating pressures of less than the test pressure shall not be connected to the piping system during test.

1. Systems on which the normal operating pressure is less than 0.5 pounds per square inch gauge (psig), the test pressure shall be 5.0 psig and the time interval shall be 30 minutes.

2. Systems on which the normal operating pressure is between 0.5 psig and 5.0 psig, the test pressure shall be 1.5 times the normal operating pressure or 5.0 psig, whichever is greater, and the time interval shall be 30 minutes.

3. Systems on which the normal operating pressure is 5.0 psig or greater, the test pressure shall be 1.5 times the normal operating pressure, and the time interval shall be one (1) hour.

E. After testing is complete, the entire gas system shall be purged with dry nitrogen to eliminate all air, debris and moisture from the piping before natural gas is introduced into the system.

F. After successful results of pressure test and purging have been completed, a leakage test shall be performed in accordance with NFPA 54 Appendix D.

G. Connect, inspect and purge gas utilization equipment, lab hook-ups, outlets, etc., and place into operation only after successful results of pressure test, leakage test and purging have been completed and accepted.

H. In all instances in which leaks are then found, they shall be eliminated in the manner designated by the Owner's duly authorized representative. Testing operations shall be repeated until gas-piping systems are absolutely tight at the pneumatic test pressures indicated above.

I. The Contractor shall make all arrangements to assure that AHJ Inspectors view the final test and that a certificate is provided from the Inspectors verifying that the installation meets requirements.

J. Pressure test gas piping sleeve system with clean, dry compressed air at 15 psig by temporarily sealing all openings between gas carrier pipe and sleeve and vent openings. Sleeve systems must be demonstrated to be absolutely tight when subjected to this pressure for a period of four hours.

END OF SECTION 22 20 23

SECTION 223333 - ELECTRIC WATER HEATERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. This section covers providing all labor and materials for the complete first class installation of point-of-use electric storage (6 - 50 gallon) tank type domestic water heaters indicated and scheduled on Contract Drawings complete with all controls, piping, valves, wiring, supports, accessories, testing, and other normal parts required for complete, code compliant, operable installation that is acceptable to the authorities having jurisdiction.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. Underwriters Laboratories Listings

1.04 QUALITY ASSURANCE

A. Heaters shall be designed to limit the maximum temperature to avoid scalding.

B. Manufacturer Qualifications: Company shall have minimum three years documented experience specializing in manufacturing the products specified in this section.

C. Provide equipment with manufacturer's name, model number, and rating/capacity permanently identified.

D. Water heater shall meet or exceed the minimum energy factor requirements of ASHRAE Standard 90.1 -2013.

E. Installer Qualifications: Company shall have minimum three years documented experience specializing in performing the Work of this section. Installation of plumbing systems shall be performed by individuals licensed by the Texas State Board of Plumbing Examiners as a Journeyman or Master Plumber. Installation may be performed by Apprentice Plumbers provided they are registered with the Texas State Board of Plumbing examiners and under direct supervision of a licensed plumber. All installation shall be supervised by a licensed Master Plumber.

F. Products and installation of specified products shall be in conformance with recommendations and requirements of the following:

1. National Sanitation Foundation (NSF).

2. National Electric Code (NFPA 70).

3. UL Standard 1453 or UL Standard 174 - Electric Booster and Commercial Storage Tank Water Heaters.

1.05 SUBMITTALS

A. Product Data:

1. Include dimension Drawings of water heaters indicating piping, components and required connections.

2. Manufacturer's data sheets, wiring diagrams and Installation Instructions.

3. Provide complete description of equipment materials, electrical characteristics, options provided, warranty, maximum water pressure requirements and code compliance.

B. Record Documents:

1. Provide full written description of manufacturer’s warranty.

C. Operation and Maintenance Data:

1. Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

1.06 DELIVERY, STORAGE AND HANDLING

A. Accept products on Site in factory packaging. Inspect for damage. Maintain products in factory packaging until installation.

B. Provide temporary inlet and outlet caps when not factory provided. Maintain caps in place until installation.

C. Protect components from damage after installation.

D. Do not allow use of heater for any reason, other than testing, during the construction phase of this project.

1.07 WARRANTY

A. The manufacturer shall provide a three-year warranty in writing against tank leaks caused by corrosion and one-year parts warranty against operational failure due to faulty manufacturing or materials.

B. The complete system shall be warranted in writing against defects in materials or workmanship under normal use and service for a period of one year after date of Substantial Completion.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.02 TANK TYPE DOMESTIC WATER HEATER

A. Acceptable manufacturers

1. State

2. Rheem

3. A.O. Smith (design basis)

4. All electric point-of-use storage tank type water heaters provided within this project shall be the product of one manufacturer.

B. Furnish and domestic hot water heaters with dimensions, capacities and electrical characteristics as scheduled on the Contract Drawings and as outlined herein. This Specification describes minimum quality and performance requirements. Variations of system components by the individual referenced manufacturers are acceptable for installation in this project provided they meet or exceed all of the requirements indicated herein, are compatible with the electrical service provided and fit properly in the allocated space.

C. Heater shall have 150 psi working pressure and be equipped with extruded high density anode rod. All internal surfaces of the heater exposed to water shall be glass-lined with an alkaline borosilicate composition that has been fused to steel by firing at a temperature range of 1600°F.

D. Direct-Immersion threaded electric heating elements heating elements shall be medium watt density with zinc plated copper sheath. Each element shall be controlled by an individually mounted thermostat and high temperature cutoff switch. Heaters having double-elements shall be provided with simultaneous wiring to permit both elements to operate at the same time.

E. The heater outer jacket shall be of baked enamel finish and shall be provided with full size control compartment for performance of service and maintenance through hinged front panels and shall enclose the tank with foam insulation.

F. Water heater shall have a properly sized, factory provided temperature and pressure relief valve.

G. The tank drain valve shall be located in the front for ease of servicing.

2.03 VACUUM RELIEF VALVES

A. Construction shall be bronze body with silicone disc having a dry guide which is located out of the water. Unit shall open at less than 1/2" vacuum and be suitable for use within a system having a maximum water pressure of 200 psi and a maximum temperature of 250°F. Vacuum relief valves shall be in compliance with the appropriate requirements of ANSI Z21.22.

B. Vacuum relief valves shall be manufactured by Watts Regulator, Wilkins or Conbraco.

PART 3 - EXECUTION

3.01 PREPARATION

A. Provide 4” high reinforced concrete housekeeping pad beneath floor mounted water heaters or provide heater with legs/base manufactured by heater manufacturer.

3.02 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer’s published recommendations.

C. Install water heaters, piping, wiring and accessories in accordance with the manufacturer’s installation instructions.

D. Furnish all supports required by the equipment included in this Contract in accordance with the manufacturer’s published instructions.

E. Each water heater located above ceiling or at any location where leakage would result in damage to the building or its contents shall be provided with and set within a safety pan equipped with a minimum ¾ inch drain connection. Safety pans shall be minimum 24 gauge galvanized sheet metal and be three inches larger on all sides than the water heater, with a minimum depth of two inches.

F. Connect and extend copper piping from pan drain connection and temperature and pressure relief valve and discharge separately to the exterior of the building and terminate between 6 and 24 inches above grade at a visible location that cannot cause damage to property or personnel. Relief valve shall not discharge into safety pan.

G. Safety pan and relief valve drain lines shall be copper and installed so that all water will drain completely out of the piping. Where it is impractical or physically impossible to extend a drain line to the building exterior, drain lines shall discharge separately into a floor drain, housekeeping mop sink or other location approved by the MD ANDERSON building inspector.

H. Each water heater shall be provided with clear access and unobstructed passageway that is adequate to allow removal and replacement.

I. Install heater in a vertical position with a clearance on all sides for servicing. Coordinate location of unit to avoid conflicts with other system or building components.

J. Furnish and install all necessary valves, strainers, unions, etc. to facilitate proper functioning and servicing of equipment.

K. Provide dielectric isolation device where copper lines connect to ferrous lines or equipment.

L. Install an accessible line size shutoff valve in cold water inlet within two feet of heater.

M. Provide heat trap inlet piping for storage type heaters to prevention migration of heated water into cold water system.

N. Provide heat trap in outlet piping for storage type heaters serving non-circulated distribution systems.

O. Provide a vacuum relief valve in cold water supply to heaters having bottom feed inlet. Install valve in accordance with manufacturer's recommendations.

P. Provide a temperature gauge in the outlet piping adjacent to storage type heaters. Locate gauge in an easily readable position.

Q. Flush water supply line to remove all air, scale and dirt prior to connecting heater.

R. Take precautions to prevent heat generated by soldering procedures from being transmitted to heater components.

S. Coordinate with Electrical Contractor for power and wiring required. Verify that electrical power is connected to a properly grounded dedicated branch circuit of proper voltage rating and equipped with ground fault interrupter. Each heater shall be provided with an independent circuit. Insure that the correct wire and circuit breaker sizes are provided.

T. When all plumbing installation is completed, check for leaks and take corrective action before proceeding. Flow hot water until temperature has stabilized. Verify and insure that the water meets scheduled temperature at all outlets. Clean heater water prior to final inspection of installation.

3.03 TRAINING

A. Contractor shall instruct and acquaint the Owner with the proper functioning, operation and maintenance of the water heater and all associated installed components.

END OF SECTION 223333

SECTION 224000 - PLUMBING FIXTURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. This section includes the furnishing of all labor and materials necessary for a complete installation of all plumbing fixtures indicated on the Drawings and specified herein.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. 2009 Edition of the International Plumbing Code

2. Texas Department of Licensing and Regulation, Texas Accessibility Standards of the Architectural Barriers Act, Article 9102, Texas Civil Statutes

3. Americans with Disabilities Act, 28 CFR Part 35 Nondiscrimination on the Basis of Disability in State and Local Government Services, Final Rule, as published in the Federal Register

4. ICC/ANSI A117.1, "Accessible and Usable Buildings and Facilities" relative to plumbing fixtures for people with disabilities

5. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water

6. Texas Health and Safety Code, Chapter 372, Environmental Performance Standards for Plumbing Fixtures

7. ANSI/ASME A112, Plumbing Standards

1.04 PRODUCTS NOT FURNISHED BUT INSTALLED UNDER THIS SECTION

A. Rough-in for and make final connection to Owner furnished fixtures and equipment requiring plumbing services.

B. Rough-in for and make final connection to fixtures and equipment furnished under other divisions of these Contract Specifications requiring plumbing services.

1.05 QUALITY ASSURANCE

A. Fixtures, trim, accessories and carriers of any one type shall be by the same manufacturer throughout.

B. All fixtures and trim shall be new, institutional/commercial quality and free from mars, chips, scratches, blemishes or any defects.

1.06 SUBMITTALS

A. Product Data:

1. Provide manufacturer's data sheets indicating Code and Standards compliance, illustrations of fixtures, physical sizes, rough-in dimensions, utility sizes, trim and finishes.

B. Record Documents:

1. Provide full written description of manufacturer's warranty.

2. Manufacturer's installation instructions.

C. Operation and Maintenance Data:

1. Include installation instructions, exploded assembly views. servicing requirements, inspection data, installation instructions, spare parts lists, replacement part numbers and availability, location and contact numbers of service depot, for all plumbing specialties installed.

1.07 DELIVERY, STORAGE AND HANDLING

A. Accept fixtures on Site in factory packaging. Inspect for damage.

B. Protect all fixtures and trim before and after installation from exposure to rain, freezing temperatures and direct sunlight. EXCEPTION: Materials manufactured for installation within exterior environments.

C. Protect installed fixtures and trim from damage and/or entry of foreign materials by temporary covers during the construction phase of this project.

D. Do not allow use of installed fixtures and trim for any reason, other than testing, during the construction phase of this project.

1.08 FIELD MEASUREMENTS

A. Verify that field measurements are either as indicated on Shop Drawings or as instructed by the manufacturer. Designate within submittals that measurements have been verified, and note which measurements are the basis for construction.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A.	Stainless Steel Sinks:	Just, Elkay
B.	Mop Sinks:	Crane/Fiat, Stern Williams
C.	Drinking Fountains:	Oasis, Sunroc, Elkay, Halsey Taylor

D.	Emergency Shower/Eyewash:	Guardian
E.	Vitreous China Water Closets:	American Standard, Kohler, Crane, Eljer
F.	Vitreous China Urinals:	American Standard, Kohler, Crane, Eljer
G.	Vitreous China Lavatories:	American Standard, Kohler, Crane, Eljer
H.	Lavatory/Sink Faucets:	Chicago, American Standard
I.	Electronic Lavatory/Sink Faucets:	Chicago "HyTronic", TOTO "EcoPower", American Standard
J.	Manual Flush Valves:	Sloan "Royal", Zurn "AquaVantage", American Standard
K.	Electronic Flush Valves:	TOTO "EcoPower", Sloan "Optima", Zurn "AquaSense", American Standard
L.	Shower/Bathtub Mixing Valves:	Chicago "Tempshield", Powers "Hydroguard", Watts
M.	Shower Heads/Hand Sprayer:	Chicago, Powers, Leonard, Speakman, American Standard
N.	Fixture Stops & Supplies:	Chicago
O.	Fixture Traps:	Chicago, McGuire
P.	Toilet Seats:	Church, Bemis, Olsonite, American Standard
Q.	Fixture Carriers:	Wade, Josam, Zurn, Smith, Jay R. Smith
R.	A.D.A. Insulation Kits:	Mcguire, Truebro, Brocar

2.02 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Provide plumbing fixtures as indicated and scheduled on the Contract Drawings and as specified herein.

C. Fixtures, trim and accessories of any one type shall be by the same manufacturer.

D. All vitreous china fixtures shall be white in color unless noted otherwise on Drawings.

E. All plumbing fixture trim within public toilet rooms shall be furnished with vandal-proof trim.

F. All exposed brass fixture trim shall be heavily chrome plated.

G. Fittings and piping shall be brass and, wherever exposed, shall be polished chrome-plated. Provide tight fitting wall or floor escutcheons of chrome-plated brass or stainless steel wherever pipes pass through floors, walls or ceilings.

H. Fixture supplies shall be loose key angle stops with 1/2" I.P.S. female inlets and shall include wall flanges and brass risers. All components shall be chrome plated. In all cases, all piping, tubing, fittings and faucets shall be installed using mechanical non-slip connections, such as bull-nose, flanged, ferrule or threaded fittings. Fittings requiring a friction fit using slip-on or gasket connections are not acceptable. [EXCEPTION: Hose type riser supplies are acceptable when supplied and required by the fixture manufacturer]. Supply riser tubing for lavatories and sinks shall be minimum 3/8” O.D.

I. Provide A.D.A. compliant molded insulation on exposed water and drain piping beneath handicap accessible lavatories and sinks. Insulation shall be designed to allow removal and re-installation for pipe servicing.

J. Unless noted otherwise, install each lavatory, sink and drinking fountain with chrome-plated, 17 gauge trap with cleanout plug that is easily removable for servicing and cleaning. Slip joints shall be permitted only on the fixture trap inlet, within the trap seal and at outlet connection to the trap adapter.

K. Wall mounted lavatories, urinals and drinking fountains shall be supported with commercial carriers bolted to floor, model to suit installation. Provide concealed arm type carriers for lavatories.

L. Fixtures shall have flow control devices to limit the flow of water to a maximum rate in accordance with the following table:

1.	Shower Valve or Head:	1.5 GPM (at 80 psi)
2.	Lavatory Faucet:	0.5 GPM (at 60 psi)
3.	Sink Faucet:	0.5 GPM (at 60 psi)
4.	Water Closet Flush Valve:	1.28 Gallons Per Flush
5.	Urinal Flush Valve:	0.125 Gallon Per Flush

M. Stainless Steel Sinks

1. Stainless steel sinks shall be 18 gauge, Type 304 stainless steel with insulation undercoating.

2. Provide stainless steel covers for all unused sink faucet/accessory holes. Covers shall be secured with stainless steel bolt and wing nut. Snap-in type covers are not acceptable. Covers shall provide a watertight seal by utilizing rubber gasket or plumbers putty.

3. Sink strainer shall be 316 stainless steel.

N. Janitor Mop Sinks

1. Precast terrazzo receptor shall be composed of marble chips and white Portland cement ground smooth, grouted and sealed to resist stains.

2. Stainless steel caps shall be cast integral on all curbs.

3. Shoulders shall not be less than 9-3/4" high inside measurement, and not less than 1-1/4" wide.

4. Tiling flanges shall be cast integral and extend 1" above shoulder on 1, 2 or 3 sides (as required per Project).

5. Drain shall be cast integral with stainless steel strainer and shall provide for a caulked lead connection not less than 1" deep to a 3" pipe.

O. Water Closets

1. Water closets shall be vitreous china, wall-mounted elongated bowl having siphon jet flushing action design.

2. Water closet bowl gaskets shall be neoprene, felt gaskets and wax rings are not permitted.

3. Wall mounted water closets shall be supported with extra-heavy duty commercial carriers bolted to floor and rated for a 500 pound load. Carrier model shall be designed for the actual fixture being supported and provided with all options and accessories manufactured by the carrier manufacturer for a complete installation. Provide auxiliary foot support as recommended by the manufacture to prevent bending of fixture support stud bolts.

4. Water closet seats shall be commercial/institutional grade, white in color, have open front and stainless steel self-sustaining check hinges.

P. Flush Valves

1. All electronic flush valves shall be provided with manual override activators.

Q. Faucets

1. Provide faucets with laminar flow outlets. Aerators shall not be acceptable. Faucet flow control devices shall be located at the spout outlet.

2. Provide vacuum breakers for all faucets that have threaded or serrated hose connection outlets.

3. Provide integral hot and cold water inlet check stops in all mixing type sink faucets that have hose connection outlets.

4. All electronic lavatory faucets located within public toilet rooms shall be designed and manufactured to allow continuous water flow during usage for a maximum duration of ten seconds after initial activation.

R. Shower and Bathtub Mixing Valves

1. Shower and bathtub mixing valves shall be ASME A112.18.1M, CSA B125, ASSE 1016 and ADA compliant, having combination thermostatic/pressure balancing replaceable cartridge, integral check valves, integral stops and high temperature limit set at 110° F.

2. Thermostatic/pressure balance mixing valves shall have brass body construction with polished chrome plated finish, lever control handles for volume and temperature, and 1/2" NPT connections.

3. Provide showerheads, tub spouts, hand-held shower systems, diverters, vacuum breakers and other trim accessories as scheduled on Contract Drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Confirm that millwork is constructed with adequate provision for the installation of countertop lavatories, sinks, faucets and related trim and accessories.

C. Verify that electric power is available and of the correct characteristics.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes required by code, as recommended by the manufacturer, and as indicated in Contract Drawings fixture rough-in schedule.

3.03 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. Furnish and install all labor, materials, equipment, tools and services and perform all operations required in connection with or properly incidental to the installation of complete plumbing fixtures, as indicated on Contract Drawings, reasonably implied therein or as specified herein, unless specifically excluded.

D. Each piece of trim shall be furnished whether specifically mentioned or not, in order to provide a complete first-class installation. Furnish and install all required water, waste, soil and vent connections to all plumbing fixtures, together with all fittings, supports, fastening devices, cocks, valves, traps, etc., leaving all in complete working order.

E. Provide accessible check valves in the individual cold and hot water fixture supply lines serving mixing valve type faucets or assemblies having hose connection outlets that are not equipped with integral check stops.

F. Coordinate mounting heights of plumbing fixtures with architectural details/elevations.

G. Install A.D.A. compliant water closet flush valve handles on wide side of toilet stalls.

H. Install fixtures and trim in accordance with manufacturer's instructions.

I. All exposed chrome plated, polished or enameled fixtures and trim shall be installed with special care, leaving no tool marks on finishes. Install flexible brass fixture supply risers using manufactured tube bending tools. Bending tubes only with the use of hands shall not be permitted.

J. Install each fixture trap, easily removable for servicing and cleaning.

K. Provide chrome-plated deep escutcheons where required to cover non-chrome-plated piping projecting through walls.

L. Thoroughly fill spaces between fixtures and walls, countertops and/or floors with waterproof, mold resistant, non-toxic, non-shrinkable white tile caulking.

M. Install components firmly fixed, level and plumb.

N. Install and secure all wall mounted fixtures in place with commercial carriers and bolts in accordance with manufacturer's instructions. Fixture weight shall not be transmitted to walls, partitions or service piping. Installation shall prevent any movement of fixture during use.

O. All non-monolithic shower floors shall be provided with drain pan attached to floor drain flange in accordance with the latest edition of the Uniform Plumbing Code. Refer to Architectural Contract Specifications and Drawings for pan materials and additional installation requirements.

3.04 INTERFACE WITH OTHER PRODUCTS AND TRADES

A. Review millwork Shop Drawings. Confirm location and size of fixtures and openings before rough-in and installation.

B. Provide templates for all fixtures to be mounted in millwork to General Contractor.

C. Coordinate with Electrical Contractor and insure proper power is provided for electric drinking fountains, sensor operated faucets and sensor operated flush valves

3.05 TESTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise or overflow.

B. Adjust and set sensor faucet mixing valves to provide desired water temperature at spout outlet.

C. Insure that all traps are filled with water and maintain trap seal. Each fixture shall be filled and then drained. Traps and fixture connections shall be proven water tight by visual inspection.

D. After fixtures have been installed and water systems are pressurized, test each fixture and associated trim for proper operation and inspect for leaks. Replace malfunctioning fixtures and components, then retest. Repeat procedure until all components operate properly.

E. Test drain pans installed for non-monolithic shower floors prior to installation of finished flooring. Fill pan with water to within 1” of top. Pan must maintain test water level without leakage for at least eight hours

3.06 CLEANING

A. Thoroughly clean all plumbing fixtures and equipment furnished under this Contract prior to final acceptance.

B. Thoroughly flush and clean all faucet spout outlet screens and flow control devices.

3.07 PROTECTION OF FINISHED WORK

A. Do not permit use of fixtures until after Substantial Completion has been announced by Owner.

END OF SECTION

SECTION 230513 - VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. Perform all Work required to provide and install a complete variable frequency motor drive (VFD) consisting of a pulse width modulated (PWM) inverter designed for use on a standard NEMA Design B induction motor.

B. The drive manufacturer shall supply the drive and all necessary controls as specified.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. Standard 519, IEEE Guide for Harmonic Content and Control.

2. ANSI/UL Standard UL508C, Underwriter’s Laboratories.

3. ICS 7.0, AC Adjustable Speed Drives, National Electrical Manufacturer’s Association (NEMA).

4. IEC 16800 Parts 1 and 2.

1.04 QUALITY ASSURANCE

A. Company specializing in manufacturing the products specified in this Section with minimum three (3) years experience.

B. VFD and options shall be UL listed as a complete assembly. VFD’s that require the customer to supply external fuses are not acceptable.

C. VFD and options shall be tested to ANSI/UL Standard 508 and listed by a nationally recognized testing agency such as UL or ETL.

D. VFD and options shall comply with applicable requirements of the latest Standards of ANSI/UL, IEEE, and the NEC.

1.05 SUBMITTALS

A. Product Data:

1. Submit product data for components and accessories.

2. All VFD's for this Project shall be supplied by one manufacturer.

3. Submit Shop Drawings indicating outline dimensions, enclosure construction, lifting and supporting points, electrical one-line diagram, equipment electrical ratings, noise levels (including driven equipment) and total harmonic distortion (voltage and current).

4. Manufacturer shall provide terminal block to terminal block wiring diagrams coordinated with the Owner to provide a complete and functional operating system. Furnish detailed Drawings showing construction, dimensions, wiring diagrams, and installation procedures for Engineer's approval.

B. Operation and Maintenance Data:

1. Submit manufacturer's written installation instructions.

2. Submit training outline.

3. Furnish harmonic analysis verifying compliance with specified distortion levels.

4. Furnish a list of recommended spare parts.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to the Project Site under provisions of Division 01 and Division 20.

B. Accept products on Site in factory-fabricated protective container with factory installed shipping skids and lifting lugs. Inspect for damage.

C. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures and finish.

1.07 EXTRA MATERIALS

A. Submit two insulated-handle tools designed for pulling fuses in accordance with ANSI/IEEE C37.46.

B. Refer to Section 26 28 13 for fuse requirements.

1.08 WARRANTY

A. VFD shall be unconditionally warranted by the manufacturer for two (2) years from the date of Substantial Completion, not to exceed 30 months from date of shipment.

B. Warranty shall include all parts, labor, shipping, field service or technician time, labor or travel expenses, and verbal or written correspondence with the VFD manufacturer or VFD manufacturer's representatives. Include correspondence which might be incidental to the proper installation and operation of the equipment.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Furnish complete VFD controllers that convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of three-phase AC motors. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor magnetization current suitable for centrifugal pump and fan control and to eliminate the need for motor derating.

C. Contractor shall check equipment schedules on the Contract Drawings to determine if the VFD “bypass” switch option is required to allow the motor to run if the controller malfunctions.

D. VFD manufacturer shall verify compatibility of motor furnished on equipment. One controller shall control the speed of one motor with the exception being a wall fan technology system.

E. VFD shall convert 3 phase, 60 Hz utility power to adjustable voltage and frequency, 3 phase AC power for stepless motor speed control from 10 percent to 100 percent of the motor’s 60 Hz speed. Input voltage characteristics are 480 volts, 3 phase, 60 Hz.

F. VFD shall include a converter section. The converter section shall convert fixed frequency and voltage AC utility power to a variable DC voltage. VFD’s that use silicon controlled rectifiers in the converter bridge shall also include 5 percent reactors. Isolation transformers are not acceptable in lieu of line reactors.

G. VFD shall include an inverter section. The inverter section shall invert the variable DC voltage into a PWM wave form; adjustable voltage and frequency output for stepless motor speed control.

H. Individual or simultaneous operation of VFD’s shall not add more than 5 percent total harmonic voltage distortion and no more than 5 percent total harmonic current distortion (per IEEE 516-1992) to the normal bus.

   1. VFD manufacturer shall perform harmonic analysis based on the electrical one-line diagram.

   2. The VFD manufacturer shall provide calculations specific to this installation, showing total harmonic voltage distortion is less than 5 percent.

   3. Input line filters shall be sized and provided as required by the VFD manufacturer to ensure compliance with IEEE Standard 519. All VFD’s shall include a minimum of 5 percent impedance reactors, no exceptions.

I. VFD shall include a coordinated AC transient protection system consisting of 4-120 joule rated MOV’s (phase to phase and phase to ground), a capacitor clamp, and 5 percent impedance reactors.

J. Alternate Harmonics Specification:

   1. Input line reactors and DC Bus filtered chokes (factory installed and wired in the drive enclosure) shall be provided to allow reliable operation on a typical commercial power distribution system and to minimize harmonics reflected onto the input line.

      a. Shall not interfere with computer and other electronic systems in the building.

      b. If not inherently protected, provide a suitable isolation transformer.

      c. The system shall not produce spikes on the incoming line.

   2. Any inverter that generates sufficient electrical line noise to interfere with operation of sensitive building equipment shall be field modified or replaced by the inverter supplier at no additional cost to the Owner.

K. EMI / RFI filters. All VFD's shall include EMI/RFI filters. The onboard filters shall allow the VFD assembly to be CE Marked and the VFD shall meet product Standard EN 61800-3 for the First Environment restricted level.

L. Low voltage logic and 115V control circuits shall be electrically isolated from the power circuits. Signal circuit common shall be grounded.

M. VFD shall include a power ride-through feature to allow continuous operation up to a three-cycle line loss.

N. Two independently adjustable accel and decel ramps with 1 to 1800 seconds adjustable time ramps. Extended time periods are also acceptable.

O. VFD shall have full function output current limit adjustable from 10 to 100 percent. At the factory with compatible motor, provide at least three lock-out ranges (50 rpm maximum each), two of which can be used to correct any run test problems.

P. Components shall be pretested and complete VFD shall have full burn-in under full load for a minimum of 12 hours. Provide at least three lockout ranges (50 rpm maximum), two of which can be used to correct run test problems.

Q. Ambient noise generated by the VFD shall be limited to an amount equal to the system noise level as designated by the latest ASHRAE noise level guidelines for such equipment at each octave band. Noise level criteria at different octave bands and mid-frequencies shall be furnished with the submittal data.

R. VFD shall include a motor flux optimization circuit that will automatically reduce applied motor voltage to the motor to optimize energy consumption and audible motor noise.

2.02 MANUFACTURERS

A. Danfoss Graham.

B. ABB. (Design Basis)

C. Yaskawa Electric.

2.03 ENCLOSURE

A. VFD shall be enclosed in a UL Listed Type 12 enclosure. Enclosure shall be UL listed as a plenum rated VFD. The VFD tolerated voltage window shall allow operation from a line of +30 percent nominal, and -35 percent nominal voltage as a minimum.

B. Environmental operating conditions: 0 to 40 degrees C continuous. VFD's that can operate at 40 degrees C intermittently (during a 24-hour period) are not acceptable and must be oversized. Altitude from 0 to 3300 feet above sea level, less than 95 percent humidity, non-condensing. VFD's without these ratings are not acceptable.

C. The following operator controls shall be located on the front of the enclosure:

1. Bypass Hand-Off-Auto.

2. Drive mode selector.

3. Bypass mode selector.

4. Bypass fault reset.

5. Provide the following indicating lights (LED type). In addition, provide test mode or push to test feature:

a. Power-on (ready).

b. Run enable (safeties) open.

c. Drive mode select damper opening.

d. Bypass mode selected.

e. Drive running.

f. Bypass running.

g. Drive fault.

h. Bypass fault.

i. Bypass H-O-A mode.

j. Automatic transfer to bypass selected.

k. Safety open.

l. Damper opening.

m. Damper end-switch made.

6. Provide the following relay (form C) outputs from the bypass:

a. System started.

b. System running.

c. Bypass override enabled.

d. Drive Fault.

e. Bypass fault (motor overload or underload-broken belt).

f. Bypass H-O-A position.

D. Digital inputs for the system shall accept 24V or 115VAC (selectable).

E. Customer Interlock Terminal Strip: Provide a separate terminal strip for connection of freeze, fire, smoke contacts, and external start command. All external safety interlocks shall remain fully functional whether the system is in Hand, Auto, or Bypass modes (not functional in fireman's override 2). The remote start/stop contact shall operate in VFD mode.

F. Dedicated digital input that will transfer motor from VFD mode to bypass mode upon dry contact closure for fireman's override. Two modes of operation are required:

1. The first mode forces the motor to bypass operation and overrides both the VFD and bypass H-O-A switches and forces the motor to operate across the line (test mode). The system will only respond to the digital inputs and motor protections.

2. The second mode operates as the first, but will also defeat the overload and singe-phase protection for bypass and ignore all keypad and digital inputs t the system 9run until destruction).

G. Include a “run permissive circuit” that will provide a normally open contact whenever a run command is provided (local or remote start command in VFD or bypass mode). The VFD system (VFD or bypass) shall not operate the motor until it receives a dry contact closure from a damper or valve end-switch. When the VFD system safety interlock (fire detector, freezestat, high static pressure switch, etc) opens, the motor shall coast to a stop and the run permissive contact shall open, closing the damper or valve.

H. Include Class 20 or 30 (selectable) electronic motor overload protection.

2.04 BYPASS

A. Furnish where indicated on the Drawings, a complete factory wired and tested bypass system consisting of an output contactor and bypass contactor. Overload protection shall be provided in both drive and bypass modes.

B. Bypass to be furnished, built, and mounted by the VFD manufacturer.

C. Provide an internal switch to select manual or automatic bypass.

D. Provide an adjustable current sensing circuit for the bypass to provide loss of load indication (broken belt) when in the bypass mode.

E. Door interlocked, disconnect that will disconnect all input power from the drive and all internally mounted options.

F. Fused VFD only disconnect (service switch). Fast acting fuses exclusive to the VFD – fast acting fuses allow the VFD to disconnect from the line prior to clearing upstream branch circuit protection, maintaining bypass capability. Bypass designs, which have no such fuses, or that incorporate fuses common to both the VFD and the bypass will not be accepted. The following contactor bypass schemes are not acceptable.

1. Door interlocked main input disconnect switch.

2. Power on light.

3. “Drive-off-bypass” manual mode selector switch.

G. The bypass shall incorporate an internally sourced power supply and shall not require an external power source.

2.05 DISPLAY / KEYPAD

A. All applicable operating values shall be capable of being displayed in engineering (user) units. A minimum of three (3) operating values from the list below shall be capable of being displayed at all times. The display shall be in complete English words (alpha-numeric codes are not acceptable):

1. Output frequency.

2. Motor speed (RPM, percent, or engineering units).

3. Motor current.

4. Calculated motor torque.

5. Calculated motor power (kW).

6. DC bus voltage.

7. Output voltage.

B. Keypad shall include a backlit LCD display. The display shall be in complete English words for programming and fault diagnostics (alpha-numeric codes are not acceptable). The keypad shall use the following assistants:

1. Start-up assistants.

2. Parameter assistants.

3. Maintenance assistant.

4. Troubleshooting assistant.

C. VFD shall have the same customer interface, including digital display, and keypad, regardless of horsepower rating. Keypad shall be removable, capable of remote mounting and shall allow for uploading and downloading of parameter settings as an aid for start-up of multiple VFD's.

D. Keypad shall include Hand-Off-Auto selections and manual speed control. The drive shall incorporate "bumpless transfer" of speed reference when switching between "Hand" and "Auto" modes. There shall be fault reset and "Help" buttons on the keypad. The Help button shall include "on-line" assistance for programming and troubleshooting.

E. Provide a built-in time clock with battery back-up in the VFD keypad. The time clock shall be used to date and time stamp faults and record operating parameters at the time of fault. If the battery fails, the VFD shall automatically revert to hours of operation since initial power up. The time clock shall also be programmable to control start/stop functions, constant speeds, PID parameter sets and output relays. The VFD shall have a digital input that allows an override to the time clock (when in the off mode) for a programmable time frame. There shall be four (4) separate, independent timer functions that have both weekday and weekend settings.

2.06 SERIAL COMMUNICATION

A. VFD shall have the capability of communicating with the building automation system (BAS) via an RS-485 serial port.

B. VFD shall be provided with protocol information specific to the selected BAS Provider and shall be pre-configured at the factory to provide automatic communications without the need for field programming.

C. VFD shall continue to provide serial communications regardless of how inverter is being controlled ("manual" mode via keypad, "automatic" mode via BAS, or "stopped" mode via either keypad or automatic BAS start/stop signal).

D. Serial communications capabilities shall include, but not be limited to:

1. Run/stop control speed set adjustment.

2. Proportional/integral or PID control adjustments.

3. Current limit.

4. Accel/decel time adjustments.

E. VFD shall have the capability of allowing the BAS to monitor the following feedback signals:

1. Process variable.

2. Output speed/frequency.

3. Current.

4. Torque.

5. Power (kW).

6. Operating hours.

7. Kilowatt hours (kWh).

8. Relay outputs.

9. Diagnostic warning and fault information.

F. VFD shall allow the BAS to control the drive's digital and analog outputs and monitor all drive digital and analog inputs via the serial interface.

G. VFD shall be capable of providing the BAS with status signals for bypass operation and external safety trips via serial interface.

2.07 SYSTEM OPERATION

A. Selector switch in the "off" position: controller run circuit shall be open and the system shall not operate.

B. Selector switch in the "manual" position: motor speed shall be controlled by the manual speed potentiometer.

C. Selector switch in the "auto" position: operation shall be via input 0 to 10 VDC or 4-20 mA signal with strategy output speed proportional to the input signal. If required into the controls strategy, VFD manufacturer shall furnish a pressure transducer mounted in the drive enclosure to convert a 3 to 15 psi pressure signal to a 0 to 10 VDC signal or 4-20 mA signal.

PART 3 - EXECUTION

3.01 PREPARATION

A. Verify that surfaces are ready to receive Work.

B. Verify that field measurements are as shown on Shop Drawings and as instructed by manufacturer.

C. Verify that required utilities are available, in the proper location, and ready for use.

3.02 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. Power wiring shall be completed by the Electrical Contractor in accordance with the recommendations of the VFD manufacturer as outlined in the installation manual.

3.03 TESTING

A. Manufacturer shall provide a factory trained technician to inspect, test and start-up the VFD and associated equipment and place the VFD into operation.

B. A harmonic test verifying the distortion level shall be included as part of Start-up and forwarded to the Owner. Any additional equipment, installation and equipment floor space required to meet the distortion level as set forth in the Specification, shall be borne by the VFD manufacturer.

3.04 TRAINING

A. Manufacturer shall provide for and present to the Owner, at no cost to the Owner, a training and troubleshooting course at the Owner's location.

1. Provide one (1) hour orientation/start-up operation training for a minimum of two (2) people.

END OF SECTION

SECTION 230593 - SYSTEM TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. Testing, adjusting, and balancing (TAB) of the air conditioning systems and related ancillary equipment will be performed by a technically qualified TAB Firm.

B. TAB Firm shall be capable of performing the TAB services as specified in accordance with the Contract Documents, including the preparation and submittal of a detailed report of the actual TAB Work performed.

C. TAB Firm shall check, adjust, and balance components of the air conditioning system which will result in optimal noise, temperature, and airflow conditions in the conditioned spaces of the building while the system equipment is operating economically and efficiently. This is intended to be accomplished after the system components are installed and operating as specified in the Contract Documents. It is the responsibility of the Contractor to place the equipment into service. Variable air volume systems shall be balanced in accordance with AABC Standard, Latest Edition or NEBB Standards for Testing, Adjusting, Balancing of Environmental Systems (Latest Edition).

D. TAB Firm shall check, adjust, and balance all hydronic systems including pumps, water distribution systems, chillers, cooling towers, boilers, heat exchangers, coils, and related equipment.

E. Liaison and Early Field Inspection:

1. TAB Firm shall act as a liaison between the Owner, Architect and Contractor. TAB Firm shall perform the following reviews (observations) and tests:

    a. During construction, review all HVAC submittals such as control diagrams, air handling devices, etc., that pertain to the ability to satisfactorily balance systems.

    b. Test at least one or at least 10 percent of the single and fan-powered terminal units if the number of units are greater then twenty (20), for casing and damper leakage when the shipment arrives at the Project Site. All testing (except for the initial terminal units) shall be performed at the Project Site.

    c. Test one (1) lab configuration including fume hood with air valve, general exhaust air with air valve and supply air with air valve for performance capability through a full range of inlet pressures. The tracking capability of the exhaust air versus the supply air will be with the submitted hood sash fully open and as the sash is closed in 2 inch increments until fully closed. Track the valves' response time in relation to sash movement and the lab differential.

2. During the balancing process, as the TAB Firm discovers abnormalities and malfunctions of equipment or components, the TAB Firm shall advise the Contractor in writing so that the condition can be corrected by the Contractor prior to finishing the TAB scope of Work. Data from malfunctioning equipment shall not be recorded in the final TAB report.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. AABC - National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems.

2. NEBB - National Environmental Balancing Bureau, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems.

3. ASHRAE HVAC Applications Chapter 37: Testing, Adjusting and Balancing.

4. ANSI/ASHRAE Standard 111: Practices for Measurement, Testing, Adjusting and Balancing of Buildings, Heating, Ventilation, Air Conditioning and Refrigeration Systems.

1.04 QUALITY ASSURANCE

A. TAB Firm shall have operated a minimum of five (5) years under TAB Firm's current name and shall be in good standing with the State of Texas, Franchise Tax Board. TAB Firm shall submit full incorporated name, Charter Number, and Taxpayer's I.D. Number for proper verification of TAB Firm's status.

B. TAB Firm's personnel performing Work at the Project Site shall be either professional engineers or certified air and water balance technicians, who shall have been permanent, full time employees of the TAB Firm for a minimum of six (6) months prior to the start of Work for this Project.

C. TAB firm shall have a background record of at least five (5) years of specialized experience in the field of air and hydronic system balancing and shall possess properly calibrated instrumentation.

1.05 SUBMITTALS

A. The activities described in this Section shall culminate in a report to be provided in quadruplicate (4), individually bound and also provided electronically to the Contractor to be presented to the Owner. Neatly type and arrange data. Include with the data, the dates tested, personnel present, weather conditions, nameplate record of test instrument and list all measurements taken after all corrections are made to the system. Record all failures and corrective action taken to remedy incorrect situation. The intent of the report is to provide a reference of actual operating conditions for the Owner's operations personnel.

B. All measurements and recorded readings (of air, water, electricity, etc.) that appear in the report must have been made at the Project Site by the permanently employed technicians or engineers of the TAB Firm.

C. At the Owner's option, all data sheets tabulated each day by TAB Firm personnel shall be submitted for review and sign-off by the Owner's Construction Inspector. Those data sheets, as initialed by Owner's Construction Inspector, shall be presented as a supplement to the final TAB report.

1.06 MECHANICAL SYSTEM

A. Submit reports on electronic forms approved by the Owner and Architect/Engineer which will include the following information as a minimum:

1. Title Page:

    a. Company name.

    b. Company address.

    c. Company telephone number.

    d. Project name.

    e. Project location.

    f. Project Manager.

    g. Project Engineer.

    h. Project Contractor.

    i. Project identification number.

2. Instrument List:

    a. Instrument.

    b. Manufacturer.

    c. Model.

    d. Serial number.

    e. Range.

    f. Calibration date.

    g. What test instrument was used for.

3. Fan Data (Supply and Exhaust):

    a. Identification and location.

    b. Manufacturer.

    c. Model.

    d. Air flow, specified and actual.

    e. Total static pressure (total external), specified and actual.

    f. Inlet pressure.

    g. Discharge pressure.

    h. Fan RPM.

4. Air Handler Return Air/Outside Air Data (If fans are used, provide fan data as noted above):

a. Identification and location.

b. Design return air flow.

c. Actual return air flow.

d. Design outside air flow.

e. Return air temperature.

f. Outside air temperature.

g. Required mixed air temperature.

h. Actual mixed air temperature.

5. Electric Motors:

a. Manufacturer.

b. Horsepower/brake horsepower.

c. Phase, voltage, amperage, nameplate, actual.

d. RPM.

e. Service factor.

f. Starter size, heater elements, rating.

6. V-Belt Drive:

a. Identification and location.

b. Required driven RPM.

c. Driven sheave, diameter and RPM.

d. Belt, size and quantity.

e. Motor sheave, diameter and RPM.

f. Center-to-center distance, maximum, minimum and actual.

7. Duct Traverse:

a. System zone/branch.

b. Duct size.

c. Area.

d. Design velocity.

e. Design air flow.

f. Test velocity.

g. Test air flow.

h. Duct static pressure.

i. Air temperature.

j. Air correction factor.

8. Air Monitoring Station Data:

a. Identification and location.

b. System.

c. Size.

d. Area.

e. Design velocity.

f. Design air flow.

g. Test velocity.

h. Test air flow.

9. Sound Level Report:

a. Location (Location established by the Engineer).

b. Baseline background NC curve for eight (8) bands – with equipment off.

c. Operating NC curve for eight (8) bands – with equipment on.

10. Control verification indicating date performed and any abnormalities identified:

a. Point Location/Description.

b. Actual Readout.

c. Interlocks.

d. Safeties:

e. Alarms.

f. Sequences of Operation.

11. Include in the appendix all submittals for air handling units, pumps, fans, heat exchangers, energy recovery units control system, etc.

1.07 PLUMBING SYSTEM

A. Submit plumbing system to operational tests to demonstrate satisfactory operation. Include the following information:

1. Title Page:

a. Company name.

b. Company address.

c. Company telephone number.

d. Project name.

e. Project location.

f. Project A/E.

g. Project Contractor.

2. Time date and duration of test for each system.

3. Water pressures at the most remote and highest fixtures.

4. Operation of each fixture and fixture trim.

5. Operation of each valve, hydrant and faucet.

6. Temperature of each domestic hot water supply.

7. Operation of each floor drain by flooding with water.

8. Operation of each vacuum breaker and backflow preventer.

9. Piping systems: Test results of all pressure tests.

PART 2 -

PART 3 - PRODUCTS

Not used.

PART 4 -

PART 5 - EXECUTION

5.01 AIR BALANCE

A. When systems are installed and ready for operation, the TAB Firm shall perform an air balance for all air systems and record the results. The outside, supply, exhaust and return air volume for each air handling unit, supply fan and exhaust fan and the supply, exhaust or return air volume for each distribution device shall be adjusted to within +/- 5 percent of the value shown on the Drawings. Air handling unit and fan volumes shall be adjusted by changing fan speed and adjusting volume dampers associated with the unit. Air distribution device volume shall be adjusted using the spin-in tap damper for flexible duct connected devices and the device opposed blade damper (OBD) for duct connected devices. Air distribution devices shall be balanced with air patterns as specified. Duct volume dampers shall be adjusted to provide air volume to branch ducts where such dampers are shown.

B. The general scope of balancing by the TAB Firm shall include, but is not limited to, the following:

1. Filters: Check air filters and filter media and balance only systems with essentially clean filters and filter media. The Contractor shall install new filters and filter media prior to the final air balance.

2. Blower Speed: Measure RPM at each fan or blower to design requirements. Where a speed adjustment is required, the Contractor shall make any required changes.

3. Ampere Readings: Measure and record full load amperes for motors.

4. Static Pressure: Static pressure gains or losses shall be measured across each supply fan, cooling coil, heating coil, return air fan, air handling unit filter and exhaust fan. These readings shall be measured and recorded for this report at the furthest air device or terminal unit from the air handler supplying that device. Static pressure readings shall also be provided for systems, which do not perform as designed.

5. Equipment Air Flow: Adjust and record exhaust, return, outside and supply air CFM(s) and temperatures, as applicable, at each fan, blower and coil.

6. Outlet Air Flow: Adjust each exhaust inlet and supply diffuser, register and grille to within + 5 percent of design air CFM. Include all terminal points of air supply and all points of exhaust. Note: For Labs and rooms that are negative exhaust air flow shall be set to design + 10 percent and supply to design - 5 percent. Positive areas will have opposite tolerances.

7. Pitot Tube Traverses: For use in future troubleshooting by Owner, all exhaust ducts, main supply ducts and return ducts shall have air velocity and volume measured and recorded by the traverse method. Locations of these traverse test stations shall be described on the sheet containing the data.

8. Maximum and minimum air flow on terminal units.

5.02 SOUND VIBRATION AND ALIGNMENT

A. Sound: Read and record sound levels at up to fifteen (15) locations per floor in the building as designated by the Architect/Engineer. All measurements shall be made using an Octave Band Analyzer. All tests shall be conducted when the building is quiet and in the presence of the Architect/Engineer, at the Architect/Engineer's option.

B. Vibration: Read and record vibration for all water circulating pumps, air handling units, and fans which have motors larger than 10 horsepower Include equipment vibration, bearing housing vibration, foundation vibration, building structure vibration, and other tests as directed by the Architect/Engineer. Readings will be made using portable IRD (or approved equal) equipment capable of filtering out various unwanted frequencies and standard reporting forms. Maximum vibration at any point listed above, or specified, shall not exceed one mil on fans and one mil on pumps unless otherwise specified. Equipment manufacturer shall rectify all systems exceeding vibration tolerances.

5.03 BUILDING AUTOMATION SYSTEMS

A. In the process of performing the TAB Work, the Contractor shall:

1. Work with the Building Automation System (BAS) Provider and Owner to ensure the most effective total system operation within the design limitations, and to obtain mutual understanding of intended control performance.

2. Verify that all control devices are properly connected.

3. Observe the calibration and operation of all controllers.

4. Observe the locations of all thermostats and humidistats for potential erratic operation from outside influences such as sunlight, drafts, or cold walls.

5. Verify that all controller setpoints meet the Contract Documents.

6. Verify the operation of all interlock systems.

5.04 PLUMBING EQUIPMENT

A. Compressed Air System:

1. Apply pressure to piping system equal to 1 and 1/2 times the operating pressure, 150 pounds per square inch-gage minimum, with oil free dry air or gaseous nitrogen and hold while testing all joints with a soap solution. Repair all leaks. Maintain pressure in piping system for a period of 15 minutes.

2. With air compressor(s) activated and attached to piping system, record compressed air readings at each compressor and at each outlet.

3. Provide services of a factory trained representative for two consecutive days to test, supervise pre-start checkout, initialize start-up, place into operation and review operating instructions. Provide certification in writing that this work was accomplished.

B. Sanitary Waste, Vent and Storm Drainage Systems: Refer to Section 22 10 00.

C. Domestic Water System: Refer to Section 22 10 00.

1.

END OF SECTION

SECTION 230713 - DUCTWORK INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. Perform all Work required to provide and install ductwork insulation and jackets indicated by the Contract Documents with supplementary items necessary for proper installation.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.
2. ASTM C168 - Terminology Relating to Thermal Insulation Materials.
3. ASTM C518 - Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
4. ASTM C553 - Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
5. ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.
6. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).
7. ASTM C1104 - Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.
8. ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.
9. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
10. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
11. ASTM E84 - Surface Burning Characteristics of Building Materials.
12. ASTM E96 - Water Vapor Transmission of Materials.
13. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

14. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

15. NFPA 255 - Surface Burning Characteristics of Building Materials.

16. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

17. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors.

18. UL 723 - Surface Burning Characteristics of Building Materials.

19. ASTM E2336 - Standard for Grease Ducts.

1.04 QUALITY ASSURANCE

A. All ductwork requiring insulation shall be insulated as specified herein and as required for a complete system. In each case, the insulation shall be equivalent to that specified and materials applied and finished as described in these Specifications.

B. All insulation, jacket, adhesives, mastics, sealers, etc., utilized in the fabrication of these systems shall meet NFPA for fire resistant ratings (maximum of 25 flame spread and 50 smoke developed ratings) and shall be approved by the insulation manufacturer for guaranteed performances when incorporated into their insulation system, unless a specific product is specified for a specific application and is stated as an exception to this requirement. Certificates to this effect shall be submitted along with Contractor's submittal data for this Section of the Specifications. No material may be used that, when tested by the ASTM E84-89 test method, is found to melt, drip or delaminate to such a degree that the continuity of the flame front is destroyed, thereby resulting in an artificially low flame spread rating.

C. Application Company Qualifications: Company performing the Work of this Section must have minimum three (3) years experience specializing in the trade.

D. All insulation shall be applied by mechanics skilled in this particular Work and regularly engaged in such occupation.

E. All insulation shall be applied in strict accordance with these Specifications and with factory printed recommendations on items not herein mentioned. Unsightly, inadequate, or sloppy Work will not be acceptable.

1.05 LEED AND SUSTAINABILITY

A. Product Data for Credit IEQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content.

B. Laboratory Test Reports for Credit IEQ 4: For adhesives and sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Submit MSDS sheets showing compliance with Section 01 81 13 - Sustainable Design Requirements.

D. Sealants shall meet the requirements of SCAQMD r1168 and CDPH v1.1-2010 for emissions

E. Paints/Coating shall meet the requirements of SCAQMD r1113 for coatings and CDPH v1.1-2010 for emissions.

F. Insulation shall contain no added formaldehyde and be certified with CDPH v1.1-2010 for emissions

1.06 SUBMITTALS

A. Product Data:

1. Provide product description, list of materials, “k” value, “R” value, mean temperature range, and thickness for each service and location.

B. Record Documents:

1. Submit under provisions of Division 01.

C. Operation and Maintenance Data:

1. Manufacturer’s Installation Instructions: Indicate procedures that ensure acceptable standards will be achieved. Submit certificates to this effect.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect, and handle products to the Project Site under provisions of Division 01 and Division 20.

B. Deliver materials to Site in original factory packaging, labeled with manufacturer’s identification including product thermal ratings and thickness.

C. Store insulation in original wrapping and protect from weather and construction traffic. Protect insulation against dirt, water, chemical, and mechanical damage.

D. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics and insulation cements.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.02 MANUFACTURERS

A. CertainTeed Corporation.

B. Johns Manville Corporation.

C. Knauf Corporation.

D. Owens-Corning.

E. Armacell North America.

F. Unifrax 1 LLC. (FyreWrap)

2.03 INSULATION MATERIALS

A. Type D1: Flexible glass fiber; ASTM C553 and ASTM C1290; commercial grade; 'k' value of 0.25 at 75 degrees F; 1.5 lb/cu ft minimum density; 0.002 inch foil scrim kraft facing for air ducts.

B. Type D2: Rigid glass fiber; ASTM C612, Class 1; 'k' value of 0.23 at 75 degrees F; 3.0 lb/cu ft minimum density; 0.002 inch foil scrim kraft facing for air ducts.

C. Type D3: Ductliner (to be used in return air sound boots only), flexible glass fiber; ASTM C1071; Type II, 'k' value of 0.23 at 75 degrees F; 3.0 lb/cu ft minimum density; coating air side for maximum 4,000 feet per minute air velocity. The airstream surface must be protected with a durable acrylic surface coating specifically formulated to:

1. Be no more corrosive than sterile cotton when tested in accordance with the test method for corrosiveness in ASTM C665.

2. Absorb no more than 3 percent by weight when tested in accordance with the test method for moisture vapor sorption in ASTM C1104.

3. Not support the growth of fungus or bacteria, when tested in accordance with the test method for fungi resistance in ASTM C1071, ASTM C1338, ASTM G21, and ASTM G22.

4. Show no signs of warpage, cracking, delaminating, flaming, smoking, glowing, or any other visibly negative changes when tested in accordance with the test method for temperature resistance in ASTM C411.

5. Have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with the test method for surface burning in ASTM E 84.

6. Meet the sound absorption requirements when tested in accordance with the test method for sound absorption in ASTM C423.

7. Show no evidence of continued erosion, cracking, flaking, peeling, or delamination when tested in accordance with the test method for erosion resistance in UL181.

D. Type D4: Fire Rated Grease Duct Insulation (High Temperature Flexible Blanket); 1-1/2-inch thick refractory grade fibrous fire barrier material with minimum service temperature design of 2,000 degrees F; aluminum foil laminated on both sides; with a minimum 'k' value of 0.25 and a minimum density of 6 lbs/cu ft; containing no asbestos. Listed by a nationally recognized testing laboratory (NRTL) UL to meet ASTM E,2336, ASTM E119, and with flame spread/smoke minimum rating of 25 / 50 when tested as per ASTM E84/UL 723.

E. Type D5: Outdoor Duct Application – Type D1 Insulation with externally wrapped galvanized sheet metal jacket with seams located on bottom side of horizontal duct section.

1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive to match jacket.

2. Secure insulation without vapor barrier with staples, tape, or wires.

3. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.

4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.

5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

6. Slope jacket to prevent water pooling.

2.04 INSULATION ACCESSORIES

A. Adhesives: Waterproof vapor barrier type, meeting requirements of ASTM C916; Childers CP-82.

B. Finish: Vapor barrier finish coating, Childers CP-11.

C. Jacket: Pre-sized glass cloth, minimum 7.8 oz/sq yd.

D. Type D4 Insulation Adhesive: Fire resistive to ASTM E84, Childers CP-82.

E. Impale Anchors: Galvanized steel, 12 gage self-adhesive pad.

F. Joint Tape: Glass fiber cloth, open mesh.

G. Tie Wire and Wire Mesh: Annealed steel, 16 gage.

H. Stainless Steel Banding: 3/4-inch wide, minimum 22 gage, 304 stainless.

I. Armaflex 520 or 520 BLV contact adhesive.

J. Armatuff 25 white seal seam tape.

PART 3 - EXECUTION

3.01 PREPARATION

A. Verify that ductwork has been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. Extend duct insulation without interruption through walls, floors, and similar penetrations, except where otherwise indicated.

D. Provide external insulation on all round ductwork connectors to ceiling diffusers and on top of diffusers as indicated in the Ductwork Insulation Application and Thickness Schedule and the Drawings. Secure insulation to the top of ceiling diffusers with adhesive that meets NFPA 90A and 90B 25/50 requirements, and vapor barrier or tape to match jacket. Do not insulate top of ceiling diffuser if it is used in ceiling return air plenum or in an open space with no ceiling.

E. Flexible and Rigid fiberglass insulation (Types D1 and D2) application for exterior of duct:

1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.

2. Install without sag on underside of ductwork. Use 4-inch wide strips of adhesive on 8-inch centers and mechanical fasteners where necessary to prevent sagging. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

3. Insulate standing seams and stiffeners that protrude through the insulation with 1-1/2 inch thick, unfaced, flexible blanket insulation. Cover with glass cloth and coat with vapor barrier finish coating.

4. On circumferential joints, the 2-inch flange on the facing shall be secured with 9/16 inch outward clinch steel staples on 2-inch centers, and taped with minimum 3-inch wide strip of glass fabric and finish coating.

5. Cover seams, joints, pin penetrations and other breaks finish coating reinforced with glass cloth.

F. Insulation (Type D5) application for outdoor ducts:

1. Horizontal ductwork located outdoors shall be sloped at a minimum 2-degree angle to prevent the accumulation of water on top of the finished insulated duct. Support members that connect directly to the ductwork are to be insulated with this same material. Keep compression or sharp creases of outdoor insulation to a minimum by distributing the weight of the duct resting on horizontal duct support members.

2. Follow the insulation manufacturer's installation instructions and procedures to assure the ductwork is properly insulated and that the insulation will meet the manufacturer's warranty requirements.

G. All ductwork, accessories, and all plenums including metal and masonry construction, etc., shall be insulated as indicated on the Drawings, as specified herein and as required for a complete system. In each case, the insulation shall be equal to that specified and materials applied and finished as described in these Specifications.

H. Flexible ductwork connections to equipment shall not be insulated.

I. Where vapor barriers are required, the vapor barrier shall be on the outside. Extreme care shall be taken that the vapor barrier is unbroken. Joints, etc., shall all be sealed. Where insulation with a vapor barrier terminates, it shall be sealed off with the vapor barrier being continuous to the surface being insulated. Ends shall not be left raw.

J. Extreme care shall be taken in insulating high and medium pressure ductwork including all ductwork between the fan discharge and all mixing boxes to ensure the duct is not pierced with sheet metal screws or other fasteners. All high and medium pressure ducts in these Specifications are classified as high velocity ductwork.

K. Where canvas finish is specified use lagging adhesive to prevent mildew in securing canvas. Do not use wheat paste. In addition, cover all canvas insulation with a fire retardant coating.

L. All ductwork in the Project except toilet exhaust ductwork, shall be insulated externally unless specifically excluded.

M. Flexible round ducts shall be factory insulated.

3.03 INSPECTION

A. Visually inspect the completed insulation installation per manufacturers recommended materials, procedures and repair or replace any improperly sealed joints.

B. Where there is evidence of vapor barrier failure or "wet" insulation after installation, the damaged insulation shall be removed, duct surface shall be cleaned and dried and new insulation shall be installed.

3.04 DUCTWORK INSULATION APPLICATION AND THICKNESS SCHEDULE

Ductwork System	Application	Insulation Type	Insulation Thickness
Supply Air (Hot, Cold, Combination)	Outside of Mechanical Rooms	D1	2"
	Inside of Mechanical Rooms	D2	1-1/2"
Return Air, Relief Air, and Exhaust Air	All	D1	1"
Outside Air	Treated and Untreated	D1	2"
Supply Air Diffusers	Top of Diffuser	D1	2"

Ductwork System	Application	Insulation Type	Insulation Thickness
Supply Air Duct	Outdoor Environment	D5	2”
Kitchen Grease Hood Exhaust Air	All	D4	3"
Return, Exhaust Air Duct	Outdoor Environment	D5	1-1/2"
Return Air Sound Boots/Elbows	All	D3	1"

END OF SECTION

SECTION 233100 - DUCTWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. Perform Work required to provide and install ductwork, flexible duct, hangers, supports, sleeves, flashings, vent flues, and all necessary accessories as indicated in the Contract Documents. Provide any supplementary items necessary for proper installation.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. ASHRAE - Handbook of Fundamentals; Duct Design.
2. ASHRAE - Handbook of HVAC Systems and Equipment; Duct Construction.
3. ASTM A 90 - Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.
4. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.
5. ASTM A 167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
6. ASTM A 525 - General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
7. ASTM A 527 - Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process, Lock Forming Quality.
8. ASTM B209 - Aluminum and Aluminum Alloy Sheet and Plate.
9. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
10. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems.
11. NFPA 96 - Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooling Equipment.
12. NFPA 45 – Laboratory Ventilating Systems and Hood Requirements.
13. SMACNA – HVAC Duct Construction Standards.

14. SMACNA – Rectangular Industrial Duct Construction Standards.
15. SMACNA – Round Industrial Duct Construction Standards.
16. SMACNA – HVAC Air Duct Leakage Test Manual.
17. UL 181 - Factory-Made Air Ducts and Connectors.
18. Engineering Design Manual for Air Handling Systems, United McGill Corporation (UMC).
19. Assembly and Installation of Spiral Ducts and Fittings, UMC.
20. Engineering Report No. 132 (Spacing of Duct Hangers), UMC.
21. AWSD1.1 American Welding Society Structural Welding Code.

1.04 DEFINITIONS

A. Low Pressure

1. 2 inch W.G. Pressure Class: Ductwork systems up to 2 inch w.g. positive or negative static pressure with velocities less than or equal to 1500 fpm.

B. Medium Pressure

1. 3 inch W.G. Pressure Class: Ductwork systems over 2 inch w.g. and up to 3 inch w.g. positive or negative static pressure with velocities less than or equal to 2500 fpm.
2. 4 inch W.G. Pressure Class: Ductwork systems over 3 inch w.g. and up to 4 inch w.g. positive or negative static pressure with velocities less than or equal to 2500 fpm.

1.05 LEED AND SUSTAINABILITY

A. Product Data for Credit IEQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content.

B. Laboratory Test Reports for Credit IEQ 4: For adhesives and sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Submit MSDS sheets showing compliance with Section 01 81 13 - Sustainable Design Requirements.

D. Sealants shall meet the requirements of SCAQMD r1168 and CDPH v1.1-2010 for emissions

E. Paints/Coating shall meet the requirements of SCAQMD r1113 for coatings and CDPH v1.1-2010 for emissions.

F. Insulation shall contain no added formaldehyde and be certified with CDPH v1.1-2010 for emissions

1.06 SUBMITTALS

A. Product Data:

1. Provide the following information for each sheet metal system furnished on the Project:

a. System name and type.

b. Duct system design pressure.

c. Duct material.

d. Duct gage.

e. Transverse joint methods.

f. Longitudinal seam type.

g. Sealant type.

h. SMACNA rectangular reinforcement type.

i. SMACNA intermediate reinforcement type.

j. SMACNA transverse reinforcement type.

B. Record Documents:

1. Submit Shop Drawings on all items of ductwork, plenums, and casings including construction details and accessories specified herein in accordance with Division 01. Ductwork construction details and materials used for duct sealant, flexible connections, etc. shall be submitted and approved prior to the fabrication of any ductwork.

2. [Option if no Shop Drawings are required: Prepare Shop Drawings for the purpose of coordination with other trades including structural, piping, plumbing, electrical, lighting, and architectural. When Shop Drawings are not required to be submitted for the Project, field sketches and shop tickets must be available to the Owner upon request. Changes required during construction to accommodate coordination issues will be performed at no additional cost to the Owner.]

3. Draw ductwork Shop Drawings on minimum 1/4 inch equal to one foot scale building floor plans and shall indicate duct sizes, material, insulation type, locations of transverse joints, fittings, ductwork bottom elevation, offsets, ductwork specialties, fire and fire/smoke dampers, and other information required for coordination with other trades. Clearly designate fire and fire/smoke partitions on the Shop Drawings. Detail Drawings for mechanical rooms and air handling unit locations shall be submitted at a minimum scale of 1/4 inch equal to one foot.

4. Coordinate with all other trades and building construction prior to submitting Shop Drawings for review. Indicate location of all supply, return, exhaust, and light fixtures from approved reflected ceiling plans on Shop Drawings.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver products to the Project Site and store and protect products under provisions of Division 01 and Division 20.

B. Protect materials from rust both before and after installation.

1.08 WARRANTY

A. All ductwork shown on the Drawings, specified or required for the air conditioning and ventilating systems shall be constructed and erected in a first class workmanlike manner.

B. The Work shall be guaranteed for a period of one (1) year from the Project Substantial Completion date against noise, chatter, whistling, vibration, and free from pulsation under all conditions of operation. After the system is in operation, should these defects occur, they shall be corrected as directed by the Owner at Contractor's expense.

PART 2 -

PART 3 - PRODUCTS

3.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

3.02 APPLICATION

A. Ductwork systems shall be constructed in accordance with the following Materials as a minimum standard. Refer to Drawings for any deviation from this Table.

AIR SYSTEM	MATERIAL	MINIMUM PRESSURE CLASSIFICATION (1)
Supply and Return Systems:	Galvanized Steel	Low Pressure
DOAD Supply	Galvanized Steel	Medium Pressure
Exhaust Air Device to Exhaust Distribution	Galvanized Steel (2)	Low Pressure
Exhaust Air Distribution	Galvanized Steel	Medium Pressure
General Exhaust Vertical Riser to Fan	Galvanized Steel	Medium Pressure
Kitchen Hood Exhaust	316L Stainless Steel	Medium Pressure(3`)
Dishwasher Exhaust	316L Stainless Steel	Medium Pressure

B. Notes to Table:

1. Positive pressure unless noted otherwise in Table.
2. Air device connections may be made with insulated flexible duct as specified herein.
3. Verify minimum pressure classification per NFPA 96 requirements.
4. Applies to exhaust system for general laboratory exhaust, fume hoods, and biosafety cabinets. Refer to Drawings for construction of any additional exhaust systems.
5. Where ductwork systems are subject to routine decontamination (HPV, Clidox, etc.), provide 316L stainless steel ductwork as indicated.

3.03 DUCTWORK MATERIAL AND CONSTRUCTION

A. All ductwork indicated on the Drawings, specified or required for the air conditioning and ventilating systems shall be of materials as hereinafter specified unless indicated otherwise on Drawings. All air distribution ductwork shall be fabricated, erected, supported, etc., in accordance with all applicable standards of SMACNA where such standards do not conflict with NFPA 90A and where class of construction equals or exceeds that noted herein.

B. Ductwork shall be constructed of G-90 coated galvanized steel of ASTM A653 and A924 Standards.

C. Minimum gage of round, oval or rectangular ductwork shall be 26 gage per SMACNA Standards.

D. All duct sizes shown on the Drawings are clear inside dimensions. Allowance shall be made for internal lining, where specified, to provide the required free area.

E. All holes in ducts for damper rods and other necessary devices shall be either drilled or machine punched (not pin punched), and shall not be any larger than necessary. All duct openings shall be provided with sheet metal caps if the openings are to be left unconnected for any length of time.

F. Except for specific duct applications specified herein, all sheet metal shall be constructed from prime galvanized steel sheets and/or coils up to 60 inches in width. Each sheet shall be stenciled with manufacturer's name and gage.

G. Sheet metal must conform to SMACNA sheet metal tolerances as outlined in SMACNA's "HVAC Duct Construction Standards."

H. Where ducts are exposed to view (including equipment rooms) and where ducts pass through walls, floors or ceilings; furnish and install sheet metal collars around the duct.

I. Spin-in fittings shall be as specified under Section 23 33 00 – Ductwork Accessories.

J. Duct Sealing: All ductwork, regardless of system pressure classification, shall be sealed in accordance with Seal Class A, as referenced in SMACNA Standards. All transverse joints, longitudinal seams, and duct wall penetrations shall be sealed.

1. All seams and joints in shop and field fabricated ductwork shall be sealed by applying one layer of sealant, then immediately spanning the joint with a single layer of 3 inches wide open weave fiberglass scrim tape. Sufficient additional sealant shall then be applied to completely embed the cloth.

2. Sealant shall be water based, latex UL 181B-M sealant with flame spread of 0 and smoke developed of 0. Sealants shall be similar to Hard Cast Iron Grip 601, Ductmate Pro Seal or Design Polymerics DP 1010.

3. Scrim tape shall be fiberglass open weave tape, 3 inches wide, with maximum 20/10 thread count, similar to Hardcast FS-150.

4. Sealer shall be rated by the manufacturer and shall be suitable for use at the system pressure classification of applicable ductwork.

5. Except as noted, oil or solvent-based sealants are specifically prohibited.

6. For exterior applications, “Uni-Weather” (United McGill Corporation) solvent-based sealant shall be used.

3.04 RECTANGULAR AND ROUND DUCTWORK

A. Metal gages listed in SMACNA HVAC Duct Construction Standards, Metal and Flexible Duct, are the minimum gages which shall be used. Select metal gage heavy enough to withstand the physical abuse of the installation. In no case shall ductwork be less than 26 gage per SMACNA Standards.

B. All longitudinal seams for rectangular duct shall be selected for the specified material and pressure classification. Seams shall be as referenced in SMACNA Standards.

C. Longitudinal seams in laboratory hood exhaust ducts shall be welded.

D. All transverse joints and intermediate reinforcement on rectangular duct shall be as shown in SMACNA Standards. Transverse joints shall be selected consistent with the specified pressure classification, material, and other provisions for proper assembly of ductwork.

E. Spiral round duct and fittings shall be as manufactured by United McGill Sheet Metal Company or approved equivalent. All fittings shall be factory fabricated, machine formed and welded from galvanized sheet metal.

F. Joints in spiral duct and fittings shall be assembled, suspended, sealed, and taped per manufacturer's published assembly and installation instructions.

G. Contractor may use DUCTMATE or Ward Industries coupling system, as an option, on rectangular ductwork. The DUCTMATE or Ward Industries system shall be installed in strict accordance with manufacturer's recommendations.

3.05 FLAT OVAL DUCTWORK AND FITTINGS

A. Oval ducts shall be spiral flat oval or welded flat oval equivalent to those of United McGill Sheet Metal Company with gage and reinforcing as recommended by the manufacturer. Duct may be shop fabricated of completely welded construction in accordance with SMACNA Standards.

B. Oval ducts greater than 24 inch x 72 inch shall be longitudinal seam, flat oval duct, rolled, welded and provided in standard lengths of 5 and 10 feet. Transverse joints shall be factory welded or field connected with flanges or slip couplings. Duct will be fabricated from galvanized steel meeting ASTM A 527 standards.

C. Duct reinforcing angles shall be of sizes specified for same size rectangular duct. Galvanized angles shall be used where standing seams are specified for rectangular duct.

D. Oval fittings shall comply with requirements, sealing, etc., similar to that specified for round ductwork. Manifolding taps may be permitted without increasing the length of run in the branch duct system.

E. Elbows in oval ducts may be smooth long radius or 5-piece 90-degree elbows and 3-piece 45-degree elbows. Joints in sectional elbows shall be sealed as specified for duct sealing.

3.06 CONICAL BELLMOUTH FITTINGS AND TAPS

A. Conical bellmouth fittings shall be made from 26-gage G-90 coated galvanized steell. Two-piece construction with a minimum overall length of 6 inches and factory sealed for high-pressure requirements. Average of loss coefficient for sizes 6, 8 and 10 shall be less than 0.055.

B. Provide each fitting with minimum 24-gage damper plate with locking quadrant operator and sealed end bearings. Damper blade shall be securely attached to shaft to prevent damper form rotating around shaft. Shaft shall be extended to clear insulation.

C. Provide a flange and gasket with adhesive peel-back paper for ease of application. The fittings shall be further secured by sheet metal screws spaced evenly at no more than 4 inches on center with a minimum of four (4) screws per fitting.

D. Conical bellmouth fittings shall be Series 3000G as manufactured by Flexmaster U.S.A., Inc. or Buckley Air Products, Inc., "AIR-TITE".

3.07 ELBOWS RECTANGULAR DUCTS

A. Construct elbows as follows in order of preference:

1. Long radius, unvaned elbows.
2. Short radius, single thickness vaned elbows.
3. Rectangular, double thickness vaned elbows.

B. Long radius elbows shall have a centerline radius of not less than one and one-half (1-1/2) times the duct width. Short radius elbows shall have a centerline radius of not less than one times the duct width.

C. Contractor shall have the option to substitute short radius vaned elbows, but shall request the substitution at the time of submittal of Product Data.

D. Provide turning vanes in all rectangular elbows and offsets.

E. Job fabricated turning vanes, if used, shall be fabricated of the same gage and type of material as the duct in which they are installed. Vanes must be fabricated for same angle as duct offset. Submit Shop Drawings on factory fabricated and job fabricated turning vanes.

F. All turning vanes shall be anchored to the cheeks of the elbow in such a way that the cheeks will not breathe at the surfaces where the vanes touch the cheeks. In most cases, this will necessitate the installation of an angle iron support on the outside of the cheek parallel to the line of the turning vanes.

G. In 90-degree turns that are over 12 inches wide in the plane of the turn, provide and install double thickness vanes on integral side rails. For ducts under 12 inches in width, use single thickness vanes. The installation of the turning vanes shall be as described for single thickness vanes. On other types of turns or elbows, single thickness trailing edge vanes shall be used.

3.08 FLEXIBLE DUCT

A. Flexible duct shall be used where flexible duct connections are shown on the Drawings to air distribution devices and terminal units and as scheduled under “Ductwork System Applications.

B. Acoustical Flexible Duct to Diffusers, Grilles, and Terminal Units:

1. Maximum flex duct length 6’-0” (six feet), installed with no more than 90 degrees of bend to diffusers and grilles. Where longer duct runs or more bends are necessary, provide rigid round ductwork.

2. Maximum flex duct length 2’-0” (two feet), installed as a straight run to the inlet of the terminal units.

3. Acoustical flexible duct shall be manufactured with an acoustically rated CPE inner film as the core fabric, mechanically locked by a corrosion-resistant galvanized steel helix.

4. Core shall be factory pre-insulated with a total thermal performance of R-3.5 or greater. Outer jacket shall be a fire retardant polyethylene vapor barrier jacket with a perm rating not greater than 0.10 per ASTM E 96, Procedure A.

5. Duct shall be rated for a minimum positive working pressure of 6 inches w.g. and a negative working pressure of 4 inches w.g. minimum.

6. Temperature range shall be –20 degrees F to 250 degrees F.

7. Duct must comply with the latest NFPA Bulletin 90A and be listed and labeled by Underwriter's Laboratories, Inc., as Class I Air Duct, Standard 181, and meet GSA, FHA and other U. S. Government standards; flame spread less than 25; smoke developed less than 50.

8. Acoustical flexible duct shall be similar to Flexmaster Type 8M for construction and acoustical performance standards.

C. Metal Flexible Duct:

1. May be used for terminal unit connections from sheet metal ductwork where shown on the Drawings.

2. Maximum length 2'-0" (two feet), installed in straight runs only. Where longer duct runs or direction changes are necessary, provide rigid round ductwork.

3. Duct shall be constructed of 0.005 inch thick 3003-H14 aluminum alloy in accordance with ASTM B209. Duct shall be spiral wound into a tube and spiral corrugated to provide strength and flexibility.

4. Core shall be factory pre-insulated with a total thermal performance of R-3.5 or greater. Outer jacket shall be fire retardant metalized vapor barrier jacket of fiberglass reinforced aluminum foil, with a permeance rating not greater then 0.05 per ASTM E96, Procedure A.

5. The duct shall be rated for a minimum positive and negative working pressure of 10 inch w.g.

6. Temperature range shall be –40 degrees F to 250 degrees F.

7. Duct must comply with the latest NFPA Bulletin 90A and be listed and labeled by Underwriter's Laboratories, Inc., as Class I Air Duct, Standard 181, and meet GSA, FHA and other U. S. Government standards; flame spread less than 25; smoke developed less than 50.

3.09 KITCHEN HOOD EXHAUST

A. Stainless steel with liquid tight welded longitudinal seams and transverse joints, as specified under "Stainless Steel Ductwork" and as further specified herein.

B. Construction shall be in accordance with NFPA 96 and applicable SMACNA Standards.

C. Slope duct toward hood connections and cleanout points as shown on the Drawings.

D. No turning vanes, dampers, or other interior intrusions shall be installed in the ductwork system.

E. All changes in direction shall be with radius elbows (centerline radius equal 1.5 x duct width).

F. Provide rated access doors for installation by the Contractor at all locations necessary.

G. Coordinate required rated enclosure of kitchen hood exhaust and access points with the Contractor.

H. Manufactured double wall duct systems with NFPA certification for grease systems may be used in lieu of above referenced materials.

3.10 EMERGENCY GENERATOR EXHAUST SYSTEM

A. Selkirk Metalbestos (Model IPS-C2), Metal Fab. Minimum standard weight black steel pipe with calcium silicate insulation is acceptable in lieu of double wall system specified herein.

B. Factory-built modular exhaust system and published skin temperatures shall be laboratory tested and listed by Underwriters Laboratories, Inc., for use with building heating equipment and appliances with produce exhaust flue gases at temperature not exceeding 1400 degrees F under continuous operating conditions. This exhaust system shall be designed to compensate for all flue gas induced thermal expansions.

C. Exhaust system shall be double wall and have an outer jacket of Type 316 stainless steel, 0.025 inch thick in 6 inch through 24 inch diameter and 0.034 inch thick for larger diameter duct. The inner flue gas carrying conduit shall be Type 316 stainless steel. The inner liner shall be 0.035 inch nominal thickness for all duct diameters.

D. To control the venting pressure should a backfire occur, an explosion relief valve shall be incorporated in the exhaust system per NFPA 37.

E. Fiber insulated exhaust system shall have a fiber insulation between the walls of 2 inches thick. Asbestos materials may not be used.

F. Inner pipe joints shall be sealed by use of overlapping type V-band (P-OVB) with a premixed 200 degrees F sealant (P-200E). The outer channel bands shall be sealed with a 600 degrees F sealant (P-600) where exposed to weather.

G. When the engine exhaust system is installed according to the manufacturer's installation instructions and the limits of its listing, it shall comply with National Safety Standards and Building Codes.

H. Exhaust system shall terminate as shown on the Drawings and per NFPA 37 and NFPA 211 requirements.

I. All exhaust system parts exposed to the atmosphere shall be protected by a minimum of one base coat and one finished coat of paint, such as Series 4200 or 4300 heat resistance paint as manufactured by Rust-Oleum Corp.

J. The exhaust system shall be installed as designed by the manufacturer and in accordance with the terms of the manufacturer's 10-year warranty.

K. Furnish all parts required to completely install the exhaust system including all flashing, storm collar, miter cuts, supports, bracing, ventilated roof thimble, sealants, tensioner, wall guide, rings, tee cap, adapter, bellows, etc. Coordinate installation with roofing Contractor.

PART 4 - EXECUTION

4.01 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. Cleanliness:

1. Before installing ductwork, wipe ductwork to a visibly clean condition.

2. During construction, provide temporary closures of metal or taped polyethylene on open ductwork and duct taps to prevent construction dust or contaminants from entering ductwork system. Seal ends of ductwork prior to installation to keep ductwork interior clean. Remove closures only for installation of the next duct section.

3. For ductwork supplying Clean Rooms, Operating Rooms and other Critical Care areas, sanitize ductwork with a biocidal agent EPA approved for HVAC systems immediately prior to sealing ductwork.

4. During duration of construction, maintain the integrity of all temporary closures until air systems are activated.

D. Provide openings in ductwork where required to accommodate thermometers, controllers and other devices. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring. Sleeve of pitot tube opening shall be no more than one inch long. Opening shall be one inch wide to accept pitot tube.

E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

F. Slope underground ducts to plenums or low pump out points at 1:500. Provide access doors for inspection.

G. Coat buried, metal ductwork without factory jacket with one coat and seams and joints with additional coat of asphalt base protective coating.

H. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.

I. Provide residue traps in kitchen hood exhaust ducts at base of vertical risers with provisions for cleanout. Use stainless steel for ductwork exposed to view and stainless steel for ducts where concealed.

J. All visible welds in ductwork between biosafety cabinets, canopy hoods and fume hoods and the ceiling shall be ground and polished.

K. Slope duct toward grilles for moisture-laden ducts. Provide drain and trap at elbow of main moisture exhaust duct system.

L. Flexible Duct:

1. The terminal ends of the duct core shall be secured by compression coupling or stainless steel worm gear type clamp.

2. Fittings on terminal units and on sheet metal duct shall have flexible duct core slipped over duct and coupling or clamp tightened, then connection sealed with sealant. Insulation of flexible duct shall be slipped over connection to point where insulation abuts terminal unit or insulation on duct.

3. These insulation connections shall be sealed by embedding fiberglass tape in the sealant and coating with more sealant to provide a vapor barrier.

M. Support flexible ducts as per SMACNA standards to prevent sags, kinks and to have 90 degree turns.

N. Hangers and Supports:

1. All ductwork supports shall be in accordance with Table 4-1 (rectangular duct) and Table 4-2 (round duct) of the SMACNA Standards, with all supports directly anchored to the building structure.

2. Rectangular duct shall have at least one pair of supports on minimum 8’-0" (eight feet) centers. All horizontal round and flat oval ducts shall have ducts hangers spaced 10’-0" (ten feet) maximum.

3. Lower attachment of hanger to duct shall be in accordance with Table 4-4 of the SMACNA Standards.

4. Vertical ducts shall be supported where they pass through the floor lines with 1-1/2 inch x 1-1/2 inch x 1/4 inch angles for duct widths up to 60 inches. Above 60 inches in width, the angles must be increased in strength and sized on an individual basis considering space requirements.

5. Hanger straps on duct widths 60 inches and under shall lap under the duct a minimum of 1 inch and have minimum of one fastening screw on the bottom and two on the sides.

6. Hanger straps on duct widths over 60 inches shall be bolted to duct reinforcing with 3/8 inch bolts minimum.

4.02 DUCTWORK SYSTEM CLEANING

A. If the system has been operated without scheduled filters or if the integrity of temporary closures has been compromised, Contractor shall have ductwork cleaned according to National Air Duct Cleaners Association (NADCA) Standards by a Certified Regular Member of the NADCA.

B. Before turning the installation over to the Owner, Contractor shall certify that the air handling systems have only been operated with scheduled filters in place. Otherwise, Contractor shall present evidence that the ductwork was cleaned as required above.

4.03 TESTING

A. All medium and high pressure duct systems (positive or negative) shall be pressure tested according to SMACNA test procedures (HVAC Air Duct Leakage Test Manual). Notify Owner minimum seven (7) calendar days in advance of leakage testing.

1. Design pressure for testing ductwork shall be determined from the maximum pressure generated by the fan at the nominal motor horsepower selected.

2. Total allowable leakage shall not exceed 1 percent of the total system design airflow rate.

3. When partial sections of the duct system are tested, the summation of the leakage for all sections shall not exceed the total allowable leakage.

4. Leaks identified during leakage testing shall be repaired by:

   a. Complete removal of the sealing materials.

   b. Thorough cleaning of the joint surfaces.

   c. Installation of multiple layers of sealing materials.

5. The entire ductwork system shall be tested, excluding connections upstream of the terminal units (i.e. ductwork shall be capped immediately prior to the terminal units, and tested as described above).

6. After testing has proven that ductwork is installed and performs as specified, the terminal units shall be connected to ductwork and connections sealed with extra care. Contractor shall inform the Owner when joints may be visually inspected for voids, splits, or improper sealing of the joints. If any leakage exists in the terminal unit connections/joints after the systems have been put into service, leaks shall be repaired as specified for other leaks.

B. All low-pressure duct systems (positive or negative) shall be inspected for visible and audible signs of leakage.

1. Leaks identified by inspection shall be repaired by:

    a. Complete removal of the sealing materials.

    b. Thorough cleaning of the joint surfaces.

    c. Installation of multiple layers of sealing materials.

2. Discrepancies found during testing and balancing between duct traverses and diffuser/grille readings shall result in re-inspection, repair and retest until discrepancies are eliminated.

C. Ductwork leakage testing and/or inspection shall be performed prior to installation of external ductwork insulation.

END OF SECTION

SECTION 233300 - DUCTWORK ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. Perform all Work required to provide and install the following ductwork accessories indicated by the Contract Documents with supplementary items necessary for proper installation.

1. Airflow control dampers and spin-in fittings.
2. Fire dampers, smoke dampers, and combination fire and smoke dampers.
3. Flexible duct connections.
4. Duct access doors.
5. Screens
6. Duct test holes.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
2. NFPA 101 - Life Safety Code.
3. SMACNA - HVAC Duct Construction Standards.
4. UL 33 - Heat Responsive Links for Fire-Protection Service.
5. UL 555 – Standard for Fire Dampers.
6. UL 555C – Standard for Ceiling Dampers.
7. UL 555S – Standard for Smoke Dampers.

1.04 LEED AND SUSTAINABILITY

A. Product Data for Credit IEQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content.

B. Laboratory Test Reports for Credit IEQ 4: For adhesives and sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Submit MSDS sheets showing compliance with Section 01 81 13 - Sustainable Design Requirements.

D. Sealants shall meet the requirements of SCAQMD r1168 and CDPH v1.1-2010 for emissions

E. Paints/Coating shall meet the requirements of SCAQMD r1113 for coatings and CDPH v1.1-2010 for emissions.

F. Insulation shall contain no added formaldehyde and be certified with CDPH v1.1-2010 for emissions

1.05 SUBMITTALS

A. Product Data:

1. Provide product data for shop fabricated assemblies including, but not limited to, volume control dampers, duct access doors, and duct test holes. Provide product data for hardware used.

B. Record Documents:

1. Fire Dampers: The damper manufacturer’s literature submitted for approval prior to the installation shall include performance data developed from testing in accordance with AMCA 500D standards and shall show the pressure drops for all sizes of dampers required at anticipated air flow rates. Maximum pressure drop through fire damper shall not exceed 0.05-inch water gauge.

2. Combination Fire/Smoke Dampers: Assign identification numbers for each damper with corresponding number noted on Drawings. Provide air quantity, size, free area of damper, pressure drop and proposed velocity through each damper. Provide manufacturer’s data of damper and its accessories or options. At Owner’s request, provide two (2) dampers (18 inch x 12 inch) for the purpose of illustrating damper operation to Owner’s operating and maintenance personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.02 MANUFACTURERS

A. Dampers:

1. Greenheck.

2. Louvers and Dampers, Inc.

3. Nailor Industries.

4. Prefco.

5. Ruskin.

B. Regulators, Locking Quadrants:

1. Ventfabrics.

2.03 AIR FLOW CONTROL DAMPERS

A. Furnish and install dampers where shown on the Drawings and wherever necessary for complete control of airflow, including all supply, return, outside air, and exhaust branches, "division" in main supply, return and exhaust ducts, and each individual air supply outlet. Where access to dampers through a permanent suspended ceiling (gypsum board) is necessary, the Contractor shall be responsible for the proper location of the access doors.

B. Dampers larger than three (3) square feet in area shall be controlled by a self-locking splitter damper assembly.

C. Volume damper blades shall not exceed 48 inches (48") in length or twelve inches (12") in width and shall be of the opposed interlocking type. The blades shall be of not less than No. 16 gage galvanized steel supported on one-half inch (1/2") diameter rust-proofed axles. Axle bearings shall be the self-lubricating ferrule type.

D. Volume dampers and other manual dampers shall be carefully fitted, and shall be manually controlled by damper regulators as follows:

1. On exposed uninsulated ductwork the locking quadrant shall be made with a base plate of 16-gage cold-rolled steel and a heavy die cast handle designed with a 3/8 inch bearing surface. A 1/4 inch-20 zinc plated wing nut shall firmly lock the handle in place.

2. On exposed externally insulated ductwork the regulator shall be 4-1/4 inch diameter, for 1/2 inch rod, designed for use on duct with insulation thickness specified for duct, and shall have four (4) 3/16 inch holes provided to rivet or screw regulator to the duct surface. The flange that covers the raw edge of the insulation shall be high enough so that it slightly compresses the insulation and holds insulation in place. The handle shall be 3/8 inch above the flange, and shall easily turn without roughing up the insulation.

3. On concealed ductwork above inaccessible ceilings, the regulator shall be 2-5/8 inch diameter chromium plated cover plate that telescopes into the base, for 1/2 inch rod. Regulator shall be cast into a box for mounting in ceilings. Base shall be 1-1/2 inch deep. The cover shall be secured by two screws that can be easily removed for damper adjustment.

4. Furnish and install end bearings for the damper rods on the end opposite the quadrant.

E. Spin-in fittings may be used for duct taps to air devices and shall include dampers on all duct to air devices (diffusers and grilles) even though a volume damper is specified for the air device. Spin-in fittings shall be similar to Flexmaster FLD with BO3 including a 2 inch buildout, nylon bushings, locking quadrant similar to Duro Dyne KR-3, and a 3/8 inch square rod connected to the damper with U-bolts. Spin-in fittings shall be sealed at the duct tap with sealant as specified herein. Determine location of spin-in fittings after terminal units are hung or after location of light fixtures are confirmed to minimize flexible duct lengths and sharp bends.

2.04 FIRE DAMPERS

A. Each fire damper shall be constructed and tested in accordance with Underwriters Laboratories Safety Standard 555, latest edition. Dampers shall possess a 1-1/2 hour or 3 hour (as appropriate for the construction shown in the architectural Drawings) protection rating, 160 or 165 degrees F fusible link, and shall bear a U.L. label in accordance with Underwriters' Laboratories labeling procedures. Construct fire dampers such that damper frame material and curtain material are galvanized.

B. Fire dampers shall be curtain blade type and damper shall be constructed so that the blades are out of the air stream to provide 100 percent free area of duct in which the damper is housed.

C. Equip fire dampers for vertical or horizontal installation as required by location shown on Drawings. Install fire dampers in wall and floor openings utilizing steel sleeves, angles and other material and practices as required to provide an installation equivalent to that utilized by the manufacturer when the respective dampers were tested by Underwriters Laboratories. Mounting angles shall be minimum 1-1/2 inch by 1-1/2 inch by 14 gage and bolted, tack welded or screwed to the sleeve at maximum spacing of 12 inches and with a minimum of two connections at all sides. Mounting angles shall overlap at least equal to the duct gage as defined by the appropriate SMACNA Duct Construction Standard, latest edition, and as described in NFPA 90A. The entire assembly, following installation, shall be capable of withstanding 6 inch water gauge static pressure.

D. All fire dampers shall be dynamic rated type.

E. Completely seal the damper assembly to the building components using manufacturer recommended material(s).

2.05 COMBINATION FIRE/SMOKE DAMPERS

A. Provide one damper motor for each 12 square feet of damper area.

B. Each combination fire/smoke damper shall be 1-1/2 hour fire rated under UL Standard 555, Current Edition, and shall be further classified by Underwriters Laboratories as a Leakage Rated Damper for use in smoke control systems under the latest version of UL555S, and bear a UL label attesting to same. Damper manufacturer shall have tested and qualified with UL, a complete range of damper sizes covering all dampers required by this Specification. Testing and UL qualifying a single damper size is not acceptable. The leakage rating under UL555S shall be no higher than Leakage Class II (4 CFM per square foot at one-inch water gauge pressure and 8 CFM per square foot at 4 inches water gauge pressure). Maximum air pressure drop through each combination fire/smoke damper shall not exceed 0.10-inch water gauge at the design air quantity. (Note that this may require a larger damper than the connected duct size.) All ratings shall be dynamic.

C. Damper frame shall be minimum 20-gage galvanized steel formed into a structural hat channel shape with tabbed corners for reinforcement, as approved in testing by Underwriters Laboratories. Bearings shall be integral high surface area non electrolytic materials construction to incorporate a friction free frame blade lap seal, or molybdenum disulfide impregnated stainless steel or bronze oilite sleeve type turning in an extruded hole in the frame or an extruded frame raceway. Dampers may be either parallel or opposed blade type. Blades shall be constructed with a minimum of 14-gage equivalent thickness. Blade edge seal material shall be able to withstand 450 degrees F. Jamb seals shall be flexible stainless steel compression type or lap seal type.

D. In addition to the leakage ratings specified herein, combination fire/smoke dampers and their operators shall be qualified under UL555S to an elevated temperature of 350 degrees F. Electric operators shall be installed by the damper manufacturer at the time of damper fabrication. Damper and operator shall be supplied as a single entity that meets all applicable UL555 and UL555S qualifications for both dampers and operators. Manufacturer shall provide a factory-assembled sleeve. Sleeve shall be minimum 20-gage for dampers where neither width nor height exceeds 48 inches or 16-gage where either dimension equals or exceeds 48 inches.

E. As part of the UL qualification, dampers shall have demonstrated a capacity to operate (open and close) under HVAC system operation conditions, with pressures at least 4 inches water gauge in the closed position, and 2500 fpm air velocity in the open position.

F. Each combination fire/smoke damper, except as noted hereinafter, shall be equipped with a UL Classified firestat/releasing device. The firestat/releasing device shall electrically (24 VAC) and mechanically (pneumatically) lock the damper in a closed position when the duct temperatures exceed 165 degrees F and still allow the appropriate authority to operate the damper as may be required for smoke control functions. Damper must be operable while the temperature is above 350 degrees F. Actuator/operator package shall include two damper position indicator switches linked directly to damper blade to provide capability of remotely indicating damper position. One switch shall close when the damper is fully open, and the other switch shall close when the damper is fully closed. The firestat/releasing device and position indicator switches shall be capable of interfacing electrically with the smoke detectors, building fire alarm system, and remote indicating/control stations or building automation system (BAS).

G. Damper releasing device shall be mounted within the airstream. Device shall be activated and the damper shall close and lock when subjected to duct temperatures in excess of approximately 285 degrees F.

H. Motors for operation of smoke dampers shall be smoke system fail safe, spring return normally open supplies and normally closed returns, or as indicated on the Drawings, and shall be furnished and installed by the damper manufacturer as required by the U.L. rating mentioned above. Motors shall be electric or pneumatic to match the type of temperature control system specified elsewhere in this Specification. Furnish all required relays, EP switches, wiring piping and other labor and material necessary to completely interconnect the smoke detector system.

I. Furnish each damper in a square or rectangular configuration. Furnish and install sleeves manufactured by the approved damper manufacturer for each damper. Construct sleeves with square or rectangular to square, rectangular, round, or oval adapters as required. Dampers shall be installed in the sleeves in accordance with manufacturer's U.L. installation instructions. The entire assembly, following installation, shall operate smoothly and be capable of withstanding 6 inch water gauge static pressure.

J. All combination fire/smoke dampers shall be dynamic type.

K. Completely seal the damper assembly to the building components using manufacturer recommended material(s).

2.06 SMOKE DAMPERS

A. Provide one damper motor for each 12 square feet of damper area.

B. Each smoke damper shall be dynamic rated type and shall be further classified by Underwriters Laboratories as a Leakage Rated Damper for use in smoke control systems under the latest version of UL555S, and bear a UL label attesting to same. Damper manufacturer shall have tested, and qualified with UL, a complete range of damper sizes covering all dampers required by this Specification. Testing and UL qualifying a single damper size is not acceptable. Leakage rating under UL555S shall be no higher than Leakage Class II (4 CFM per square foot at one-inch water gauge pressure and 8 CFM per square foot at 4 inches water gauge pressure). Maximum air pressure drop through each smoke damper shall not exceed 0.10-inch water gauge at the design air quantity. (Note that this may required a larger damper than the connected duct size.) All ratings shall be dynamic.

C. Damper frame shall be minimum 0.125-inch aluminum formed into a structural hat channel shape with corner braces for reinforcement, as approved in testing by Underwriters Laboratories. Bearings shall be stainless steel sleeve type turning in an extruded hole in the frame or an extruded frame raceway. Dampers shall be opposed blade type. Blades shall be airfoil shaped double skin construction. Blade edge seal material shall be silicone rubber designed to withstand 450 degrees F. Jamb seals shall be aluminum flexible metal compression type.

D. In addition to the leakage ratings specified herein, smoke dampers and their operators shall be qualified under UL555S to an elevated temperature of 350 degrees F. Pneumatic operators shall be installed by the damper manufacturer at the time of damper fabrication. Damper and operator shall be supplied as a single entity that meets all applicable UL555 and UL555S qualifications for both dampers and operators. Manufacturer shall provide factory-assembled sleeve. Sleeve shall be minimum 21-gage for dampers where neither width nor heights exceeds 48 inches or 16-gage where either dimensions equals or exceeds 48 inches.

E. As part of the UL qualification, dampers shall have demonstrated a capacity to operate (open and close) under HVAC system operation conditions, with pressures of at least 4 inches water gauge in the closed position, and 2000 fpm air velocity in the open position.

F. The damper must be operable while the temperature is above 350 degrees F. The actuator/operator package shall include two damper position indicator switches linked directly to damper blade to provide capability of remotely indicating damper position. One switch shall close when the damper is fully open, and the other switch shall close when the damper is fully closed. Position indicator switches shall be capable of interfacing electrically with the smoke detectors, building fire alarm systems, and remote indicating/control stations (BAS).

G. Motors for operation of smoke dampers shall be smoke system fail safe, spring return normally open supplies and normally closed returns, or as indicated on the Drawings, and shall be furnished and installed by the damper manufacturer as required by the UL rating mentioned above. Motors shall be electric or pneumatic to match the type of temperature control system specified elsewhere in this Specification. Furnish all required relays, EP switches, wiring piping and other labor and material necessary to completely interconnect the smoke detector system.

H. Furnish each damper in a square or rectangular configuration. Furnish and install sleeves manufactured by the approved damper manufacturer for each damper. Construct sleeves with square or rectangular to square, rectangular, round, or oval adapters as required. Install dampers in the sleeves in accordance with manufacturer's UL installation instructions. Entire assembly, following installation, shall operate smoothly and be capable of withstand 6 inch water guage static pressure.

I. All smoke dampers shall be dynamic type.

J. Completely seal the damper assembly to the building components.

2.07 FLEXIBLE CONNECTIONS

A. Where ducts connect to, flexible connections shall be made using "Flexmaster TL-M" or "Ventglas" fabric that is temperature-resistant, fire-resistant, waterproof, mildew-resistant and practically airtight, weighing approximately thirty ounces (30 oz.) per square yard.

B. Material used outdoors shall be resistant to ultra-violet sunrays. There shall be a minimum of one-half inch (1/2-inch) slack in the connections, and a minimum of two and one-half inches (2-1/2-inch) distance between the edges of the . This does not apply to air handling units with internal isolation.

2.08 ACCESS DOORS

A. Furnish and install in the ductwork, hinged rectangular, pressure relief, or round "spin-in" access doors to provide access to all fire dampers, mixed air plenums, steam reheat coils (install upstream), automatic dampers, etc.

B. Where ductwork is insulated, access doors shall be double skin doors with one inch (1") of insulation in the door.

C. Where duct size permits, doors shall be eighteen inches (18") by sixteen inches (16"), or eighteen inches in diameter, and shall be provided with Ventlok No. 260 latches (latches are not required in round doors).

D. Latches for rectangular doors smaller than 18 inch x 16 inch shall be Ventlok No. 100 or 140.

E. Doors for zone heating coils shall be Ventlok, stamped, insulated access doors, minimum 10 inch x 12 inch, complete with latch and two (2) hinges, or twelve inches (12") in diameter.

F. Round access doors shall be "Inspector Series" spin-in type door as manufactured by Flexmaster USA.

G. Doors for personnel access to ductwork shall be nominal twenty-four inches (24") in diameter. Doors may be fabricated in a local approved sheet metal shop in accordance with SMACNA Standards.

H. Where access doors are installed above a suspended ceiling, this Contractor shall be responsible for the proper location of ceiling access doors.

2.09 SCREENS

A. Furnish and install screens on all duct, fan, etc., openings furnished by this Contractor which lead to, or are located outdoors.

B. Screens shall be No. 16 gage, one-half inch (1/2") mesh in removable galvanized steel frame.

C. Provide safety screens meeting OSHA requirements for protection of maintenance personnel on all fan inlets and fan outlets to which no ductwork is connected.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer’s published recommendations.

C. Provide balancing dampers at points on low pressure supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing.

D. Provide all dampers furnished by the BAS Provider in strict accordance with manufacturer’s written installation instruction and requirements of these Specifications.

E. Provide fire dampers, and combination fire and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

F. Provide backdraft dampers on exhaust fans or exhausts ducts where indicated. Install dampers so that they will open freely.

G. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment. Cover connections to medium and high pressure fans with leaded vinyl sheet, held in place with metal straps.

H. Provide duct access doors for inspection and cleaning before and after duct mounted filters, coils, fans, automatic dampers, at fire dampers, and elsewhere as indicated on Drawings. Provide minimum 8 x 8 inch (200 x 200 mm) size for hand access, 18 x 18 inch (450 x 450 mm) size for shoulder access, and as indicated.

I. Provide duct test holes where indicated and where required for testing and balancing purposes.

1. Furnish and install Ventlok No. 699 instrument test holes in the return air duct and in the discharge duct of each fan unit.

2. Install test holes in locations as required to measure pressure drops across each item in the system, e.g., outside air louvers, filters, fans, coils, intermediate points in duct runs, etc.

J. Access doors as specified elsewhere shall be provided for access to all parts of the fire and combination fire and smoke dampers. Doors shall open not less than 90 degrees following installation and shall be insulated type where installed in insulated ducts.

K. Install each fire and combination fire and smoke damper square and true to the building. The installation shall not place pressure on the damper frame, but shall enclose the damper as required by UL555 and UL555S.

3.02 TESTING

A. After each fire damper, smoke damper and combination fire and smoke damper has been installed and sealed in their prescribed openings and prior to installation of ceilings, Contractor shall, as directed by Owner, activate part or all dampers as required to verify “first-time” closure.

B. Activation of damper shall be accomplished by manually operating the resettable link, disconnecting the linkage at the fire damper fusible link, and manually operating the fire/smoke damper through the pneumatic or electronic controls as appropriate.

C. Failure of damper to close properly and smoothly on the first attempt will be cause to replace the entire damper assembly.

D. Coordinate smoke damper system interlock requirements with the fire alarm system.

END OF SECTION

SECTION 23 37 00 - AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. Perform all Work required to provide and install diffusers, diffuser boots, registers/grilles, louvers, louver penthouses, roof hoods, and goosenecks indicated by the Contract Documents with supplementary items necessary for proper installation.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. AMCA 500 - Test Method for Louvers, Dampers and Shutters.

2. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

3. ARI 890 – Rating of Air Diffusers and Air Diffuser Assemblies.

4. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.

5. SMACNA 1035 - HVAC Duct Construction Standards - Metal and Flexible.

1.04 QUALITY ASSURANCE

A. Test and rate performance of air outlets and inlets in accordance with ASHRAE 70.

B. Test and rate performance of louvers in accordance with AMCA 500.

1.05 LEED AND SUSTAINABILITY

A. Product Data for Credit IEQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content.

B. Laboratory Test Reports for Credit IEQ 4: For adhesives and sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Submit MSDS sheets showing compliance with Section 01 81 13 - Sustainable Design Requirements.

D. Sealants shall meet the requirements of SCAQMD r1168 and CDPH v1.1-2010 for emissions

E. Paints/Coating shall meet the requirements of SCAQMD r1113 for coatings and CDPH v1.1-2010 for emissions.

F. Insulation shall contain no added formaldehyde and be certified with CDPH v1.1-2010 for emissions

1.06 SUBMITTALS

A. Product Data:

1. Submit product data and Shop Drawings, indicating type, size, location, application, noise level, finish, and type of mounting.

2. Review requirements of outlets and inlets as to size, finish, and type of mounting prior to submitting product data.

B. Operation and Maintenance Data:

1. Submit manufacturer's installation instructions under provisions of Division 01.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Grilles, registers and diffusers shall be as scheduled on the Drawings Grilles, registers and diffusers shall be provided with sponge rubber or soft felt gaskets where noted on the Drawings Grilles. If a manufacturer other than the one scheduled is used, the sizes shown on the Drawings shall be checked for performance, noise level, face velocity, throw, pressure drop, etc., before the submittal is made. Selections shall meet the manufacturer's own published data for the above performance criteria. The throw shall be such that the velocity at the end of the throw in the five (5) foot occupancy zone will not exceed 50 fpm nor be less than 25 fpm except where indicated otherwise. Noise levels shall not exceed those published in ASHRAE for the type of space being served (NC level). In the vicinity of lab hoods, terminal velocity at face of hood shall not exceed 20 fpm.

C. Locations of air distribution devices on Drawings are approximate and shall be coordinated with other trades to make symmetrical patterns and shall be influenced by the established general pattern of the lighting fixtures or architectural reflected ceiling plan, but primarily located to maintain proper air distribution. Where called for on Drawings, grilles, registers and diffusers shall be provided with deflecting devices and manual dampers. These grilles, registers, and diffusers shall be the standard product of the manufacturer, and subject to review by the Architect.

D. Coordinate color and finish of the devices with the Architect.

2.02 MANUFACTURERS

A. Grilles, Registers, and Diffusers:

1. Titus Products.

2. Price Industries.

3. Nailor Industries.

B. Louvers:

1. Ruskin.

2. Greenheck.

3. Arrow.

2.03 WALL SUPPLY REGISTERS/GRILLES

A. Streamlined and individually adjustable curved blades to discharge air along face of grille with two-way deflection.

B. Fabricate 1-inch margin frame with countersunk screw, concealed mounting and gasket.

C. Fabricate of aluminum extrusions with factory clear anodized finish.

D. Provide multi-louvered equalizing grid where noted on Drawings.

2.04 WALL EXHAUST AND RETURN REGISTERS/GRILLES

A. Streamlined blades, depth of which exceeds ¾-inch spacing, with spring or other device to set blades, vertical or horizontal face as scheduled.

B. Fabricate one-inch margin frame with concealed mounting.

C. Fabricate of aluminum with 20 gage minimum frame, or aluminum extrusions, with factory baked enamel finish.

2.05 LOUVERS

A. Provide 6-inch deep louvers with blades on 45-degree slope with center baffle and return bend, heavy channel frame, birdscreen on interior side with 1/2-inch square mesh for exhaust and 3/4-inch for intake.

B. Fabricate of 12 gage extruded aluminum, welded assembly, with factory prime coat finish.

C. Furnish with exterior angle flange for installation.

D. Fabricate louver penthouses with mitered corners and reinforce with structural angles.

E. Pass 750 feet per minute free velocity with less than 0.10 inches of water pressure drop, based in accordance with AMCA 500. Water penetration less than 0.025 ounce of water per foot of free area at 900 feet per minute. Provide a minimum of 45 percent free area.

2.06 ROOF HOODS

A. Fabricate air inlet or exhaust hoods in accordance with SMACNA 1035, 1-inch classification Duct Construction Standards.

B. Fabricate of galvanized steel, minimum 16 gage base and 20 gage hood, or aluminum, minimum 16 gage base and 18 gage hood; suitably reinforced; with removable hood; birdscreen with 1/2-inch square mesh for exhaust and 3/4-inch for intake, and factory prime coat finish.

C. Roof curb shall be coordinated with Owner and roofing Contractor.

D. Hood outlet area shall be minimum two times the throat area.

2.07 GOOSENECKS

A. Fabricate in accordance with SMACNA 1035, 1-inch classification, of minimum 18 gage galvanized steel.

B. Roof curb shall be coordinated with Owner and roofing Contractor.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. Check location of air outlets and inlets and make necessary adjustments in position to conform to architectural features, reflected ceiling plans, symmetry, and lighting arrangement.

D. Install air outlets and inlets to ductwork with airtight connection.

E. Provide balancing dampers on duct take-off to diffusers, grilles and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly. The use of extractors or scoops at duct take-off to diffusers, grilles and registers is not allowed.

F. Paint ductwork visible behind air outlets and inlets matte black. Refer to Division 09.

G. Provide all specialties and frames for air distribution devices as required for proper installation in ceiling type as indicated on Architectural Drawings. Provide all cutting and patching of T-bars, gypsum board, and other ceiling systems as required for installation of air devices.

END OF SECTION

SECTION 236213 - PACKAGED DIRECT EXPANSION ROOFTOP UNITS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. Perform all Work required to provide a fully packaged air-cooled, direct expansion (DX) air conditioning (AC) unit. The packaged AC unit shall perform to manufacturer's product data, installation instructions, Start-up instructions and maintenance information indicated by all Specification Sections, and Contract Documents with supplementary items necessary for proper operation.

B. Packaged Direct Expansion Rooftop unit shall include compressors, evaporator coils, filters, supply fans, dampers, air-cooled condenser coils, condenser fans, reheat coil, gas heaters, exhaust fans, return fans, Energy Recovery Wheels (OAU-1, OAU-2 Only), economizer, hot gas bypass and unit controls.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. ARI - 1060 Rating Air-to-Air Energy Recovery Equipment.

2. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment.

3. ARI 340/360 - Commercial Unitary Air-Conditioning and Air-Source Heat Pump Equipment.

4. ARI 410 - Standard for Forced-Circulation Air-Cooling and Air-Heating Coils.

5. ANSI/ASHRAE 15 - Safety Standard for Refrigeration Systems.

6. ASHRAE 90.1 - Energy Standard for Buildings Except Low High Rise Residential Buildings.

7. ASHRAE 52.2 - Method of Testing General Ventilation Air-Cleaning Devices Used for Removal Efficiency.

8. ANSI/AMCA Standard 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.

9. AMCA Publication 211 - Certified Ratings Program - Product Rating Manual for Fan Air Performance.

10. AMCA Standard 300 - Reverberant Room Method for Sound Testing of Fans.

11. AMCA Publication 311 - Certified Ratings Program.

12. AMBA Method of Evaluating Load Ratings of Bearings ANSI-11.

13. ANSI/AMCA Standard 204 - Balance Quality and Vibration Levels for Fans.

14. ASTM B-117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

15. ANSI Z21.47 - Gas-Fired Central Furnaces.

16. ANSI/ASHRAE Standard 135 BacNet - A Data Communication Protocol for Building Automation and Control Network.

17. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.

1.04 QUALITY ASSURANCE

A. The design of the unit shall be AGA and ARI certified as combination heating-cooling units for rooftop installation.

B. Unit construction shall comply with ASHRAE 15 safety code, NEC, and UL applicable codes.

C. Cooling capacity ratings shall be in accordance with ARI standard 210/240, most recent edition.

D. In no case shall the air cooled packaged DX air conditioning unit selected have an EER or SEER (if cooling capacity is less than 65,000 Btu/hr) less than that specified in Table 6.8.1A of AHRAE 90.1.

E. Insulation and adhesive shall meet NFPA 90A requirements.

F. Unit shall be factory assembled and tested including leak testing of the coils, pressure testing of the refrigeration circuit, and run testing of the completed unit. Run test report shall be supplied with the unit in the controls compartment's literature pocket

1.05 SUBMITTALS

A. Product Data:

1. Provide literature that indicates dimensions, weight, loading, clearances, capacities, gauges, thickness, and finishes of materials, electrical characteristics and connections.

2. Rigging, installation, testing, Start-up and operating instructions, maintenance data including type and quantity of oil and refrigerant change (pounds), parts lists, and troubleshooting guide.

3. Data on energy input versus cooling load output from 100 percent to 20 percent of full load with constant entering condenser air temperature.

4. Information about control and wiring diagrams.

5. Product test data on sound power levels for both fan inlet and outlet at the rated design capacity.

6. Operating data such as fans speeds, compressor LRA and RA, sound levels

7. Product data on special condenser coating.

8. Product data on all condenser fan accessories such as controls.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to the Project Site under provisions of Division 01 and Division 20.

B. Accept products on Site in factory-fabricated protective containers or coverings, with factory-installed shipping skids and lifting lugs. Inspect for damage.

C. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

D. Check and maintain equipment on monthly basis to ensure equipment is being stored in accordance with manufacturer's recommended practices. Storage record shall be maintained that indicates above requirements have been met.

1.07 EXTRA MATERIALS

A. Provide an additional replacement set of 2-inch & 4-inch thick pleated filters as specified in contract documents. 1-inch aluminum mesh outside air pre-filter shall also be provided with an additional replacement set.

1.08 WARRANTY

A. Units shall be furnished with full coverage warranty against defects in materials. Warranty on the complete unit shall be for one year from the Substantial Completion date. On the compressors, warranty shall be for five (5) years from the Substantial Completion date.

1.09

A.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Factory assembled air-cooled Packaged Dedicated Outside Air DX air conditioning unit using a refrigerant charge (R401A) with the following construction:

1. Return plenum / economizer section
2. Filter section
3. Cooling coil section
4. Supply fan section
5. Condensing unit section
6. Access to filters, dampers, cooling coils, reheat coil, heaters, exhaust fans, return fans, energy recovery wheels, compressors, water-cooled condensers, and electrical and controls components shall be through hinged access doors with quarter turn, zinc cast, lockable handles. Full length stainless steel piano hinges shall be included on the doors.
7. Units with cooling coils shall include double sloped 304 stainless steel drain pans.
8. Compressors and unit controls contained within single isolated compartment.

9. Scroll compressors installed on sheet metal deck with rubber isolation mounts for quiet efficient operation.

10. Compressor isolation valves.

11. DX coil(s).

12. Condenser coil(s) with protective coating on fins.

13. Stainless steel evaporator coil support.

14. Blower motor(s) installed on rubber isolation mounts for quiet efficient operation.

15. Direct drive condenser fan(s).

16. Bottom access return and supply air (where applicable, else see optional horizontal discharge curb below).

17. Air filters with multiple options, efficiencies and monitoring devices.

18. Roof sloped for proper drainage.

19. Single point power connection.

20. Thermostatic expansion valves on DX coils.

21. Manual reset high pressure cutoffs.

22. Automatic reset low pressure cutoffs.

23. Run test report, wiring diagram, installation manual and Start-up form in control access compartment.

24. Weather-resistant finish paint coating which passes 2,000 hour salt spray test.

C. Optional equipment as indicated on the Drawings:

1. Power return / relief fan.

2. Smoke detectors in supply and return air.

3. Horizontal supply and return air curb.

4. Gas Furnace.

5. Energy Recovery Wheel.

D. Compressor shall have load capacity ratings per the requirements ARI 210/240.

E. Unit efficiency shall be in compliance with the requirements of the International Energy Conservation Code AHSRAE 90.

2.02 MANUFACTURERS

A. AAON (Design Basis)

B. Trane OA

C. Daikin

D. Greenheck

2.03 CABINET AND INSULATION

A. All cabinet walls, access doors, and roof shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels.

B. Unit insulation shall have a minimum thermal resistance R-value of 13. Foam insulation shall have a minimum density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D-1929 for a minimum flash ignition temperature of 610°F.

C. Unit construction shall be double wall with G90 galvanized steel on both sides and a thermal break. Double wall construction with a thermal break prevents moisture accumulation on the insulation, provides a cleanable interior, prevents heat transfer through the panel, and prevents exterior condensation on the panel.

D. Unit cabinet shall be designed to operate at total static pressures up to 6.0 inches w.g.

E. Provide lifting lugs to allow placement of the unit using a crane and sling.

F.

2.04 COMPRESSORS

A. Unit shall include a variable capacity scroll compressor on both refrigeration circuits which shall be capable of modulation from 10-100% of its capacity. On-off compressor on lead circuit is not allowed. Hot gas bypass for means of modulation is required on both circuits for extreme part load control.

B. Lead refrigeration circuit shall be provided with hot gas reheat coil, modulating valves, electronic controller, supply air temperature sensor and a dehumidification control signal terminal which allow the unit to have a dehumidification mode of operation, which includes supply air temperature control to prevent supply air temperature swings and overcooling of the space.

C. Compressors shall be isolated from the base pan with the compressor manufacturer's recommended rubber vibration isolators, to reduce any transmission of noise from the compressors into the building area.

D. Each refrigeration circuit shall be equipped with thermostatic expansion valve type refrigerant flow control.

E. Each refrigeration circuit shall be equipped with automatic reset low pressure and manual reset high pressure refrigerant safety controls, Schrader type service fittings on both the high pressure and low pressure sides, and factory installed liquid line filter driers.

2.05 CONDENSERS

A. Air-Cooled Condenser fans shall be vertical discharge, axial flow, direct drive fans.

B. Coils shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and aluminum end casings. Fin design shall be sine wave rippled.

C. Coils shall be designed for a minimum of 10°F of refrigerant sub-cooling.

D. Coils shall be helium leak tested.

2.06 FANS, MOTORS, AND DRIVES

A. Unit shall include direct drive, unhoused, backward curved, plenum supply fans.

B. Blowers and motors shall be dynamically balanced and mounted on rubber isolators.

C. Motors shall be standard (premium) efficiency ODP with ball bearings rated for 200,000 hours service with external lubrication points.

D. Variable frequency drives shall be factory wired and mounted in the unit. Fan motors shall be premium efficiency.

E. Indoor airflow and external static pressure capabilities shall be no less than the values indicated on the Drawings. Internal static pressure shall include a minimum allowance for 2-inch pleated type filters.

F. All fan(s) and motor(s) shall be in compliance with the fan power limitation in Table 6.5.3.1 of ASHRAE 90.1

2.07 AIR FILTERS

A. Front frame loaded filters shall be easily accessible for removal through access panels or doors. Unit shall include 2 inch thick, pleated panel filters with a MERV rating of 8 and a 4 inch thick secondary pleated panel filter with a MERV rating of 14.

B. Unit shall include 1 inch aluminum mesh pre filters upstream of the outside air opening.

2.08 OUTSIDE AIR/ECONOMIZER

A. Unit shall include 0-100% economizer consisting of a motor operated outside air damper and return air damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have no more than 15 CFM of leakage per sq. ft. of damper area when subjected to 2 inches w.g. air pressure differential across the damper. Damper assembly shall be controlled by spring return (sensible temperature activated fully modulating) actuator. Unit shall include outside air opening bird screen, outside air hood with rain lip and barometric relief dampers.

2.09 EVAPORATOR COILS

A. Evaporator Coils shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and galvanized steel end casings. Fin design shall be sine wave rippled.

B. Coils shall be helium leak tested.

C. Coils shall be furnished with a factory installed thermostatic expansion valves.

2.10 GAS HEAT EXCHANGER

A. Units shall be equipped with a natural gas burning heat exchanger of corrosion resistant components to provide efficient heating operation. Burner shall be designed for natural gas supply at seven (7) inches water column manifold pressure.

B. Burner shall be equipped with electronic or spark ignition, flame sensor, manual shut-off, and A.G.A. approved controls.

C. The induced draft blower shall pre-purge and shall be provided with a proving switch to prevent burner operation if blower is not in operation.

D. Units shall be equipped with gas valves with minimum two-stages of capacity (if available)

E. A.G.A. thermal efficiency for the heat exchanger shall minimum 80 percent.

F. Limit switch shall shutdown the burner in case operating controls fail.

2.11 ELECTRICAL REQUIREMENTS

A. The unit shall be designed for the electrical service designated on the Drawings.

B. Arrange electrical cabinet for connecting electrical service at one point only.

C. Power and control wiring of the unit shall be factory installed complete within the unit. Provide correctly identified suitable lugs and terminal strips for field connection to electrical power and external controls.

D. Factory equip unit with motor starters for each of the motor driven components.

E.

2.12 CONTROLS

A. Factory Installed and Factory Provided Controller

1. Unit controller shall be capable of controlling all features and options of the unit. Controller shall be factory tested.

2. Controller shall be capable of stand-alone operation with unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling available without dependence on a building management system.

3. Controller shall have an onboard clock and calendar functions that allow for occupancy scheduling.

4. Controller shall include non-volatile memory to retain all programmed values, without the use of an external battery, in the event of a power failure.

5. With modulating gas heat option, a field installed supply air temperature sensor shall be furnished to control the amount of heating. Supply air temperature setpoint shall be field adjustable.

6. With enthalpy activated fully modulating economizer option, an outdoor air humidity sensor shall be factory installed.

7. With the modulating hot gas reheat option a space humidity sensor and supply air temperature sensor shall be furnished with the unit for field installation. Suction pressure sensor shall be factory installed. Supply air temperature and space humidity setpoints, for the dehumidification mode of operation, shall be adjustable.

8. Outside air temperature sensor shall be factory mounted and wired. Supply air temperature sensor and space temperature sensor with temperature setpoint reset and unoccupied override shall be furnished with the unit for field installation.

2.13 ACCESSORIES

A. Curbs shall to be fully gasketed between the curb top and unit bottom with the curb providing full perimeter support, cross structure support and air seal for the unit. Curb gasket shall be furnished within the control compartment of the rooftop unit to be mounted on the curb immediately before mounting of the rooftop unit.

B. Knockdown curbs (with duct support rails) shall be factory furnished for field assembly.

C. Solid bottom curb shall be factory assembled and fully lined with 1 inch neoprene coated fiberglass insulation and include a wood nailer strip. (Curb shall be adjustable up to 3/4 inch per foot to allow for sloped roof applications.)

D. Refer to drawing for the height and curb discharge configuration.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer’s published recommendations.

C. Gas/electric packaged air conditioning units shall be installed according to manufacturer's recommendations to be completely weatherproof. Protect the roof from damage during installation. Secure factory touch-up paint to repair scratches and minor damage to equipment prior to Start-up.

D. Power wiring to the units, including externally mounted service disconnect switch, shall be furnished and installed under Division 26. Installing Contractor shall be provided with the manufacturer's Shop Drawings as required for power wiring installation.

E. Controls for conditioned spaces shall be as required under Division 25, Building Automation System. Control wiring shall be under Division 23. Actual pulling of wires may be accomplished by subcontract or Division 26 Contractor; however, Division 25 shall retain responsibility for correctness of wiring, connections, and full operation of the control system.

3.02 TESTING

A. Equipment shall be cycled through all heating, cooling, and ventilation cycles to ensure proper operation of all components and controls prior to test and balance.

B. At time of Start-up, manufacturer's representative shall visit the Project Site and verify that unit installation and performance is satisfactory, and to make any adjustments or settings to unit operating and safety controls that may be required.

C. Include Start-up checkout service of at least one working day for one service technician, including a written report of operational check provided to the Owner. Owner’s Representative may require that the Start-up service be performed with Owner’s attendance and on-site review.

D. Clean filters shall be placed within the unit at the time of Substantial Completion.

END OF SECTION

SECTION 237433
DEDICATED OUTDOOR AIR UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof-mounted DOAS.

B. Controls.

1.02 RELATED REQUIREMENTS

A. Section 230513 - Common Motor Requirements for HVAC Equipment.

B. Section 230548 - Vibration and Seismic Controls for HVAC.

C. Section 230934 - Variable-Frequency Motor Controllers.

D. Section 233300 - Air Duct Accessories: Flexible duct connections.

1.03 REFERENCE STANDARDS

A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment 2023.

B. AHRI 270 - Sound Performance Rating of Outdoor Unitary Equipment 2015, with Addendum (2016).

C. AHRI 520 - Performance Rating of Positive Displacement Condensing Units 2004.

D. ASHRAE Std 23 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units 2022.

E. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NEMA MG 1 - Motors and Generators 2021.

G. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2021.

I. UL (DIR) - Online Certifications Directory Current Edition.

J. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data with dimensions, duct and service connections, accessories, controls, electrical nameplate data, and wiring diagrams.

C. Shop Drawings: Indicate dimensions, duct and service connections, accessories, controls, electrical nameplate data, and wiring diagrams.

D. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

E. Operation And Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

F. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

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

B. Installer Qualifications: Company specializing in performing the type of work specified in this section and approved by manufacturer.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturers warranty for compressor/condenser unit.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Trane

B. Daikin.

C. Substitutions: See Section 016000 - Product Requirements.

D. **Basis of Design: Aaon.**

2.02 ROOF-MOUNTED DOAS PERFORMANCE REQUIREMENTS

A. Performance Ratings: ASHRAE Std 90.1, EER and COP as applicable.

B. Regulatory Requirements: AHRI 270 rated, NFPA 70, and UL (DIR) listed.

C. Supply Fan Section:
   1. External Static Pressure: _____ in-wc (_____ Pa).
   2. Fan Operation: Constant volume.

D. Return-Exhaust Fan Section:
   1. Fan Operation: Constant volume.

E. Packaged DX Cooling Section:
   1. Condenser Ambient Air Temperature: 105 degrees F (40 degrees C).

F. Enthalphy Economizer Section: Damper modulation based.

G. Energy Recovery Section:
   1. Total Heat Effectiveness: 55 percent.
   2. Latent Heat Effectiveness: 50 percent.
   3. Sensible Heat Effectiveness: 65 percent.

2.03 ROOF-MOUNTED DOAS

A. Packaged Unit:
   1. Casing and Components:
      a. Fabrication: AHRI 210/240 and UL 207 construction, ASHRAE Std 23 tested.
      b. 18 gauge, 0.0478 inch (1.21 mm) steel panels reinforced with structural angles and channels to ensure rigidity.
      c. Provide bolted access panels to access each sections from either side of unit.
      d. Provide hinged door with lockable handle for serviceable sections.
      e. Drain Pan: Galvanized steel with corrosion-resistant coating.
   2. Performance Ratings: ASHRAE Std 90.1, EER and COP as applicable.
   3. Regulatory Requirements: AHRI 270 rated, NFPA 70, and UL (DIR) listed.
   4. Insulation: Double wall cabinet with R-13 insulation.
   5. External Surface Finish: Heat resistant baked enamel.
   6. Outdoor Installation: Weatherproofed casing, with intake louver or hood.
   7. Outside Air Damper with Rain Hood and Screen:
      a. Set outdoor air dampers to fully open when fan starts and close 30 seconds after fan stops, adjustable.

B. Filter Section:
   1. Prefilter: Removable, metal frame fitted 1 inch (25 mm) thick disposable glass fiber.
   2. Filter: Removable, 4 inches (100 mm) thick combined MERV-8 and MERV-14.

3. Monitoring: Provide gauge with loaded setpoint-adjustable signal flag or external tag. Provide loaded filter alarm switch wired into unit controls with illuminated indicator on local control panel face.

C. Heating Section:
   1. Electrical:
      a. Finned tube heating elements easily accessible with automatic reset thermal cut-out, built-in silicone-controlled rectifier (SCR) interface, galvanized steel frame with airflow proving switch, load fuse, manual reset switch, pilot-duty toggle switches, step-down controls transformer, service lights, service GFCI receptacle, and thermal cut-out switch.
      b. Controls: Start supply fan before electric elements are energized and continue operating until air temperature reaches minimum setting, with switch for continuous fan operation. Integrate or coordinate controls with unit controller.

D. Cooling Section:
   1. Packaged DX Cooling:
      a. Configuration: AHRI 520 rated, R-410a refrigerant system with hot gas bypass.
      b. Evaporator Coil: Copper tube aluminum fin coil assembly with alternate row circuiting, and with galvanized drain pan and thermostatic expansion valve.
      c. Compressor: Inverter-duty hermetic variable speed, 3,600 rpm maximum resilience with positive lubrication, crankcase heater, high pressure control, low pressure control, motor overload protection, service valves and dryer.
      d. Condenser Side: Aluminum fin and copper tube coil, direct drive axial fan resiliently mounted, galvanized fan guard. ECM condenser fans.
      e. Operating and Safety Controls: Internally coordinated with main unit controls.

E. Enthalpy Economizer Section: Provide factory-installed sensors, electrically-actuated return air damper, and electrically-actuated exhaust damper fully coordinated with return, exhaust, or return-exhaust fan section. Configure controls for fault-detection diagnostics.

F. Energy Recovery Section: Provide wheel recovery device fully coordinated with return, exhaust, or return-exhaust fan section.

G. Fan Section:
   1. Provide direct or plenum mounted variable-speed fan motors; see Section 230513.
   2. Draw-through, forward-curved fan, constructed of corrosion-resistant, galvanized material and designed for efficient, quiet operation.
   3. Factory program for both soft start and constant flow output over static pressure range.
   4. Provide preinstalled neutral wire protection when required to support specified fan type.
   5. Motor to include thermal overload protection, quick disconnect plug, and permanently lubricated bearings.
   6. Belt-Driven Motor Requirements: Provide adjustable blower motor/sheave combination device based on indicated flow performance requirements. Statically and dynamically balanced centrifugal fan mounted on solid steel shaft with heavy-duty, self-aligning, prelubricated ball bearings and V-belt drive with matching motor sheaves and belts.
   7. Variable Speed Control: Configure controller to maintain adjustable flow setpoint for modulating or speed-switched units; see Section 230934.
   8. Fan Turndown: Design control features to allow fan speed reduction to adjustable 50 percent of its capacity when the zone set point temperature is satisfied or when unit runs in fan-only mode.

H. Furnish dedicated outdoor air unit and associated components and accessories produced by a single manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide unit- or duct-mounted smoke detectors and other NFPA 90A provisions.

C. Install unit on vibration isolator pad or roof curb; see Section 230548.

D. Provide flexible duct connections on inlet and outlet from unit; see Section 233300.

E. Connect drain pan outlet to nearest building drain system piping.

F. Adjusting: Use plenum static pressure readings against manufacturer calibration chart to adjust primary airflow as other measuring methods will not work.

3.02 MAINTENANCE

A. Provide service and maintenance of units for one year from Date of Substantial Completion.

END OF SECTION

SECTION 238129
VARIABLE REFRIGERANT FLOW HVAC SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air-source outdoor units.

B. Refrigerant piping.

C. Refrigerant branch units.

D. Indoor units.

1.02 RELATED REQUIREMENTS

A. Section 237433 - Dedicated Outdoor Air Units.

1.03 REFERENCE STANDARDS

A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment 2023.

B. AHRI 1230 - Performance Rating of Variable Refrigerant Flow (VRF) Multi-Split Air-Conditioning and Heat Pump Equipment 2021.

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.

D. ITS (DIR) - Directory of Listed Products Current Edition.

E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 1995 - Heating and Cooling Equipment Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's standard data sheets showing the following for each item of equipment, marked to correlate to equipment item markings indicated in Contract Documents:
   1. Outdoor Units:
      a. Refrigerant Type and Size of Charge.
      b. Output and Input Cooling Capacity: Btu/h (W).
      c. Output and Input Heating Capacity: Btu/h (W).
      d. Operating Temperature Range, Cooling and Heating.
      e. Fan Capacity: Flow in cfm (L/sec) with respective fan curves.
      f. External Static Pressure (ESP): In-wc (Pa).
      g. Sound Pressure Level: dB(A).
      h. Electrical Data: Complete including motor size.
      i. Maximum number of indoor units that can be served.
      j. Maximum refrigerant piping run from outdoor unit to indoor unit(s).
      k. Maximum height difference between outdoor unit to Indoor unit(s), both above and below.
   2. Indoor Units:
      a. Output and Input Cooling Capacity: Btu/h (W).
      b. Output and Input Heating Capacity: Btu/h (W).
      c. Fan Capacity: Flow in cfm (L/sec) with respective fan curves.
      d. External Static Pressure (ESP): In-wc (Pa).
      e. Electrical Data: Complete including motor size.
      f. Maximum Lift of Built-in Condensate Pump.
   3. Control Panels: Complete data of controllers, input-output points, and zones.

B. Shop Drawings: Installation drawings custom-made for this project; include as-designed HVAC layouts, locations of equipment items, refrigerant piping sizes and locations, condensate piping

sizes and locations, remote sensing devices, control components, electrical connections, control wiring connections. Include:

1. Detailed piping diagrams, with branch balancing devices.
2. Condensate piping routing, size, and pump connections.
3. Detailed power wiring diagrams.
4. Detailed control wiring diagrams.
5. Locations of required access through fixed construction.
6. Drawings required by manufacturer.

C. Operating and Maintenance Data:

1. Manufacturer's complete standard instructions for each unit of equipment and control panel.
2. Custom-prepared system operation, troubleshooting, and maintenance instructions and recommendations.
3. Identification of replaceable parts and local source of supply.

D. Specimen Warranty: Copy of manufacturer's warranties.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Company that has been manufacturing variable refrigerant volume heat pump equipment for at least 5 years.

B. Installer Qualifications: Trained and approved by manufacturer of equipment.

1.06 WARRANTY

A. Compressors: Provide manufacturer's warranty for 6 years from date of installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Daikin; _____: www.daikinac.com/#sle.

B. LG Electronics U.S.A., Inc; _____: www.lghvac.com/#sle.

C. Mitsubishi Electric Trane HVAC US, LLC; _____: www.metahvac.com/#sle.

D. Basis of Design: LG Electronics U.S.A., Inc: www.lghvac.com/#sle.

2.02 VARIABLE REFRIGERANT FLOW SYSTEM

A. Minimum System Requirements:

1. System Testing, Capacity Rating, and Performance:
   a. AHRI 1230 when cooling capacity is equal or greater than 65,000 Btu/h (19 kWh).
   b. AHRI 210/240 when cooling capacity is below 65,000 Btu/h (19 kWh).
2. Safety Certification: Bear UL 1995 tested and ITS (DIR) listed certification label.
3. Outdoor Units: Furnish installation and surface support hardware products in accordance with ASCE 7 for wind restraint.
4. Indoor Air Quality or IAQ:
   a. Provide filtered outdoor air ventilation as indicated on drawings using the integrated method using DOAS upstream of indoor units; see Section 237433.

2.03 AIR-SOURCE OUTDOOR UNITS

A. Manufacturers:

1. Air Conditioner, Cooling Outdoor Units:
2. Heat Recovery, Cooling and Heating Outdoor Units:
   a. Daikin; _____: www.daikinac.com/#sle.
   b. LG Electronics U.S.A., Inc; _____: www.lghvac.com/#sle.
   c. Mitsubishi Electric Trane HVAC US, LLC; _____: www.metahvac.com/#sle.

B. Air Conditioning Type:

1. DX refrigeration unit piped to one or more compatible indoor units either directly or indirectly through one or more intermediate refrigeration branch units.

C. Unit Cabinet:
   1. Capable of being installed with wiring and piping to the left, right, rear or bottom.
   2. Designed to allow side-by-side installation with minimum spacing and vibration isolation.
   3. Weatherproof and corrosion resistant; rust-proofed mild steel panels coated with baked enamel finish.
   4. Sound Pressure Level: 55 dB measured at 3 feet (one meter) from front of unit.

D. Heat Sink Side:
   1. Condenser Fans:
      a. Provide minimum of 2 fans for each condenser within the outdoor unit.
      b. Minimum External Static Pressure: Factory set at 0.12 in-wc (30 Pa).
      c. Fan Type: Vertical discharging, direct-driven propeller type with variable speed operation using DC-controlled ECM motors mechanically connected using permanently lubricated bearings having whole assembly protected with fan guards.
   2. Condenser Coils:
      a. Hi-X seamless copper tubes expanded into aluminum fins to form mechanical bond; waffle louver fin and rifled bore tube design to ensure high efficiency performance.

E. Refrigeration Side:
   1. Factory assembled and wired with instrumentation, switches, and controller(s) to handle unit specifics with direct coordination of remote controller(s) from indoor unit(s).
   2. Refrigeration Circuit: ECM driven dual scroll compressors, fans, condenser heat sink coil, expansion valves, solenoid valves, distribution headers, capillaries, filters, shutoff valves, oil separators, service ports, and refrigerant regulator.
   3. Refrigerant: R-410a factory charged. Controller to alarm when charge is below capacity.
   4. Variable Volume Control: Modulate compressed refrigerant capacity automatically to maintain constant suction and condensing pressures under varying refrigerant volume required to handle remote loads. Include defrost control.
   5. Provide refrigerant subcooling to ensure the liquid refrigerant does not flash when supplying to use indoor units.
   6. Capable of heating operation at low end of operating range as specified, without additional low ambient controls or auxiliary heat source; during heating operation, reverse cycle, oil return, or defrost is not permitted due to potential reduction in space temperature.
   7. Power Failure Mode: Automatically restarts operation after power failure without loss of programmed settings.
   8. Safety Devices: High pressure sensor with cut-out switch, low pressure sensor with cut-out switch, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, overcurrent protection for the inverter and antirecycling timers.
   9. Oil Recovery Cycle: Automatic, occurring 2 hours after start of operation and then every 8 hours of operation; maintain continuous heating during oil return operation.

F. Local Controls:

G. Basis of Design: Heat Recovery with LGRED Outdoor Units: LG Electronics U.S.A., Inc; Multi V 5: www.lghvac.com/#sle.
   1. LGRED Technology: Continuous heating down to ambient temperature of minus 13 degrees F (minus 25 degrees F).
   2. Outdoor Air Temperature and Humidity Sensing: For early load management.
   3. Night quiet operation with fault detection and analysis.
   4. HIPOR Compressor Technology: For efficient oil handling at compressor side.
   5. Sensor-Based Oil Management: Saves compressor energy during heating operation.
   6. Smart Load Control: Saves energy during off-peak cooling and heating operation.

7. Active Refrigerant Control: Optimizes and adjusts refrigerant charge at variable ambient temperatures.
8. Comfort Cooling: Increases supply temperature as room approaches setpoint.
9. Intelligent Defrost: Allows function customization for local weather characteristics.
10. Smart Heating: Energy-saving function that extends heating run-hour duration.
11. Subcooling and Vapor Injection: Ensures that refrigerant gets delivered in liquid state while vapor injection enhances system performance.
12. Liquid-Cooled Inverter Drive: Reduces energy draw while extending ability to operate during extreme ambient temperatures.
13. Variable Path Heat Exchanger: Optimizes system operation for local weather conditions.

2.04 REFRIGERANT PIPING

A. Two-Pipe Run: Provide low-pressure vapor and high-pressure vapor gas pipes for each indoor unit selected for seasonal heating or cooling service.

B. Three-Pipe Run: Provide low-pressure vapor, high-pressure vapor gas, and liquid pipes for each indoor unit selected for off-season heating and cooling changeover service.

C. Refrigerant Flow Balancing: Provide refrigerant piping joints and headers specifically designed to ensure proper refrigerant balance and flow for optimum system capacity and performance; T-style joints are prohibited.

2.05 REFRIGERANT BRANCH UNITS

A. Manufacturers:
1. Daikin; _____: www.daikinac.com/#sle.
2. LG Electronics U.S.A., Inc; _____: www.lghvac.com/#sle.
3. Mitsubishi Electric Trane HVAC US, LLC; _____: www.metahvac.com/#sle.

B. Outdoor unit interface to handle two or more indoor units required to do automatic off-season heating and cooling changeover.

C. Concealed box consisting internally-piped refrigeration loops, subcooling heat exchanger, and other devices coordinated by electronic valves to facilitate off-season load management between outdoor and indoor units.

D. Minimum Requirements:
1. Control direction of refrigerant flow using electronic expansion valves; use of solenoid valves for changeover and pressure equalization is not permitted due to refrigerant noise; use of multi-port branch selector boxes is not permitted unless spare ports are provided for redundancy.
2. Provide one electronic expansion valve for each downstream indoor unit served except when multiple indoor units are connected, provide balancing joints in downstream piping to keep total capacity within branch unit capacity.
3. Energize subcooling heat exchanger during simultaneous heating and cooling service.
4. Casing: Galvanized steel sheet with flame and heat resistant foamed polyethylene sound and thermal insulation.
5. Refrigerant Connections: Braze type.
6. Condensate Drainage: Provide unit that does not require condensate drainage.

2.06 INDOOR UNITS

A. Manufacturers:
1. 2 by 2 ft (0.6 by 0.6 m), 4-way, Ceiling-Recessed Cassette, Indoor Units:
   a. Daikin AC; _____: www.daikinac.com/#sle.
   b. LG Electronics U.S.A., Inc; _____: www.lghvac.com/#sle.
   c. Mitsubishi Electric Trane HVAC US, LLC; _____: www.metahvac.com/#sle.

B. Minimum Unit Requirements:
1. DX Evaporator Coil:

a. Copper tubes expanded into aluminum fins to form a mechanical bond; waffle louver fin and high heat exchange, rifled bore tube design; factory tested.
b. 2-, 3-, or 4-row cross fin design with 14 to 17 fins per inch and flare end-connections.
c. Provide thermistor on liquid and gas lines wired into local controller.
d. Refrigerant circuits factory-charged with dehydrated air for field charging.

2. Fan Section:
a. Variable or three-speed ECM fan with automatic airflow adjustment; external static pressure selectable during commissioning.
b. Thermally protected, direct-drive motor with statically and dynamically balanced fan blades.
c. Minimum-adjustable external static pressure 0.32 in-wc (80 Pa); provide for mounting of field-installed ducts.

3. Local Unit Controls:
a. Exposed Thermostat: Wall-mounted thermostat wired into controller.
b. Temperature Control: Return air control using thermistor tied to computerized Proportional-Integral-Derivative (PID) control of superheat.
c. Temperature Zones:
1) Single Indoor Unit: Set served space(s) as the local temperature zone.
2) Multiple Indoor Units: For large zones, group and coordinate related indoor units with served spaces as the local temperature zone with each indoor unit as sub-zone.

4. Return Air Filter:
a. Provide air filter rack for non-manufacturer's standard filters.

5. Condensate:
a. Built-in condensate drain pan with PVC drain connection for drainage.
b. Units With Built-In Condensate Pumps: Provide condensate safety shutoff and alarm.
c. Units Without Built-In Condensate Pump: Provide built-in condensate float switch and wiring connections.

6. Cabinet Insulation: Sound absorbing foamed polystyrene and polyethylene insulation.

C. Ceiling-Recessed Cassette, Indoor Units:
1. Ceiling mount, 4-way, 2-way, or 1-way supply air flow units with central return air grill, DX coil, tubed drain pan, and built-in controls with thermostat remotely coordinated by outdoor air unit to maintain local air temperature setpoint.
2. Cabinet Height: Maximum of 10 inches (250 mm) above face of ceiling.
3. Exposed Housing: White, impact resistant, with washable decoration panel.
4. Supply Airflow Adjustment:
a. Horizontally and vertically adjustable dampers with electronic actuators.
b. Four-way distribution field-modifiable to 3-way and 2-way airflow.
c. Three auto-swing positions, including standard, draft prevention and ceiling stain prevention.
5. Return Air Filter: Manufacturer's standard.
6. Sound Pressure Range: Between 28 to 33 dB(A) at low speed measured at 5 feet (1.5 m) below the unit.
7. Fan: Direct-drive turbo type, with motor output range of 1/16 to 1/8 hp (45 to 90 W).
8. Condensate Pump: Built-in with minimum lift of 21 inches (533 mm).
9. Fresh Air Intake: Provide side-mounted outdoor air intake duct connection.
10. Fresh Air Intake: Provide side-mounted outdoor air intake duct connection.

D. Ceiling-Concealed Ducted Indoor Units:
1. Manufacturers:
a. High Static, Ceiling-Concealed Ducted Indoor Units:
1) Daikin; _____: www.daikinac.com/#sle.
2) LG Electronics U.S.A., Inc; _____: www.lghvac.com/#sle.

3) Mitsubishi Electric Trane HVAC US, LLC; _____: www.metahvac.com/#sle.

2. Type: Ducted unit with DX coil, tubed drain pan, and built-in controls with thermostat remotely coordinated by outdoor air unit to maintain local air temperature setpoint.
3. Ducted horizontal discharge and side or back-end return; galvanized steel cabinet.
4. Variable or three-speed ECM fan with automatic airflow adjustment; external static pressure selectable during commissioning.
5. Return Air Filter: Manufacturer's standard.
6. Sound Pressure: Measured at low speed at 5 feet (1.5 m) below unit.
7. Provide external static pressure switch adjustable for high efficiency filter operation
8. Condensate Pump: Built-in, with lift of 9 inches (229 mm), minimum.
9. Switchbox accessible from side or bottom.

E. Wall Mounted, Indoor Units:
1. Manufacturers:
a. Daikin; _____: www.daikinac.com/#sle.
b. LG Electronics U.S.A., Inc; _____: www.lghvac.com/#sle.
c. Mitsubishi Electric Trane HVAC US, LLC; _____: www.metahvac.com/#sle.
2. DX coil, tubed drain pan, and built-in controls with thermostat remotely coordinated by outdoor air unit to maintain local air temperature setpoint.
3. Variable or three-speed ECM cross-flow fan with automatic airflow adjustment; external static pressure selectable during commissioning.
4. Return Air Filter: Manufacturer's standard.
5. Provide exposed unit casing with removable front grille; foamed polystyrene and polyethylene sound insulation; wall mounting plate; polystyrene condensate drain pan.
6. Airflow Control: Auto-swing louver that closes automatically when unit stops; five (5) steps of discharge angle, set using remote controller; upon restart, discharge angle defaults to same angle as previous operation.
7. Sound Pressure Range: Measured at low speed at 3.3 feet (1 m) below and away from unit.
8. Condensate Drain Connection: Back, with piping concealed in wall.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that required electrical services have been installed and are in the proper locations prior to starting installation.

B. Verify that condensate piping has been installed and is in the proper location prior to starting installation.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install refrigerant piping in accordance with equipment manufacturer's instructions.

C. Perform wiring in accordance with NFPA 70, National Electric Code (NEC).

D. Coordinate with installers of systems and equipment connecting to this system.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Provide manufacturer's field representative to inspect installation prior to startup.

3.04 SYSTEM STARTUP

A. Prepare and start equipment and system in accordance with manufacturer's instructions and recommendations.

B. Adjust equipment for proper operation within manufacturer's published tolerances.

3.05 CLEANING

A. Clean exposed components of dirt, finger marks, and other disfigurements.

3.06 CLOSEOUT ACTIVITIES

A. Demonstrate proper operation of equipment to Owner's designated representative.

B. Demonstration: Demonstrate operation of system to Owner's personnel.
   1. Use operation and maintenance data as reference during demonstration.
   2. Conduct walking tour of project.
   3. Briefly describe function, operation, and maintenance of each component.

C. Training: Train Owner's personnel on operation and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Location: At project site.

END OF SECTION

SECTION 238239 - UNIT HEATERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. Perform all Work required to provide and install unit heaters indicated by the Contract Documents with supplementary items necessary for proper installation.

1. Centrifugal roof, up-blast, and sidewall exhauster.

2. Centrifugal roof supply fan

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. NFPA 70 – National Electrical Code.

2. ASHRAE 90.1 – “Energy Standard for Buildings Except Low-Rise Residential Buildings”.

3. ARI 440-98 – “Room Fan-Coils”.

4. ANSI/UL-883 – “Safety Standards for Fan Coil Units and Room Fan Heater Units”.

5. NFPA 90A – “Standard for the Installation of Air Conditioning and Ventilation Systems”.

1.04 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three (3) years documented experience.

1.05 SUBMITTALS

A. Submit under provisions of Division 01 and Division 20.

B. Product Data:

a. Submit product data indicating typical catalog of information including dimensions, weights, capacities, ratings, fan performance, gages and finishes of materials, electrical characteristics and connection requirements.

b. Submit fan curves with specified operating point clearly plotted. The fan curves shall clearly demonstrate that the fan coil unit will operate stably within the range of performance scheduled.

c. Submit coil performance data as tested and certified per ARI standards.

d. Submit electrical requirements for power supply wiring, clearly indicating factory-installed and field-installed wiring.

e. The submittal shall indicate that all materials meet NFPA 90 flame/smoke spread levels of 25/50 or better.

2. Submit manufacturer's installation instructions.

C. Record Documents:

1. Shop Drawings: Indicate materials and methods of assembly, unit dimensions, weight loading, required clearances, field connection details, electrical characteristics and dimensional views as required to adequately describe the unit.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver products to the Project Site and store and protect products under provisions of Division 01 and Division 20.

B. Protect units from physical damage by storing in protected areas and leaving factory covers in place.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.02 UNIT HEATER

A. Coils:

1. Seamless copper tubing, 0.025 inch minimum wall thickness.

2. Silver brazed to steel headers with evenly spaced aluminum fins mechanically bonded to tubing rated at system working pressures as indicated on Drawings.

3. All valves shall be outside of unit for gauge cocks and thermometer wells.

B. Casing: 18-gage steel with threaded pipe connections for hanger rods.

C. Finish: Factory applied baked enamel of a color as selected by the Architect on visible surfaces of enclosure or cabinet.

D. Fan:

1. Direct drive propeller type, statically and dynamically balanced, with fan guard.

2. Horizontal models with permanently lubricated sleeve bearings.

3. Vertical models with grease lubricated ball bearings.

E. Air Outlet: Adjustable pattern diffuser on projection models and four way louvers on horizontal throw models.

F. Motor:

1. Refer to Section 20 05 13.

2. Horizontal models with permanently lubricated sleeve bearings.

3. Vertical models with grease lubricated ball bearings.

G. Manufactureres:

1. Trane

2. Markel

PART 3 - EXECUTION

3.01 PREPARATION

A. Verify that surfaces are ready to receive work and opening dimensions are as indicated on Shop Drawings.

B. Verify that required utilities are available, in proper location and ready for use.

3.02 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. Hang heaters from building structure with pipe hangers anchored to the building, not from piping. Mount units as high as possible to maintain greatest headroom unless otherwise indicated on the Drawings. Refer to Section 20 05 48 for vibration isolation.

D. Install unit heaters exposed to finished areas, after walls and ceiling are finished and painted. Avoid damage.

E. Protect units with protective covers during balance of construction.

F. Leave adequate room to access and service all components.

3.03 CLEANING

A. After construction and painting is completed, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

B. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

C. Install new filters after Substantial Completion.

END OF SECTION

SECTION 26 01 00 - BASIC ELECTRICAL REQUIREMENTS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. Drawings are necessarily diagrammatic by their nature and are not intended to show every connection in detail or every pipe or conduit in its exact location. Carefully investigate structural and finish conditions and coordinate the separate trades in order to avoid interference between the various phases of Work. Organize and lay out Work so that it will be concealed in furred chases and suspended ceilings, etc., in finished portions of the building, unless specifically noted to be exposed. Install all Work parallel or perpendicular to building lines unless otherwise noted.

B. The intent of the Drawings is to establish the types of systems and functions; not to set forth each item essential to the functioning of the system. Install the Work complete, including minor details necessary to perform the function indicated. Review pertinent Drawings and adjust the Work to conditions shown. Where discrepancies occur between Drawings, Specifications, and actual field conditions, immediately notify the Owner's Project Manager for Owner's interpretations.

C. Coordinate the actual locations of electrical outlets and equipment with building features and equipment as indicated on architectural, structural, mechanical, and plumbing Drawings. Review any proposed changes in electrical wiring devices or equipment location with the Owner's Project Manager. Owner may direct relocation of outlets before installation, up to five (5) feet from the position indicated, without additional cost. Remove and relocate outlets placed in an unsuitable location when requested by the Owner, at no additional cost to the Owner.

D. All dimensional information related to new structures shall be taken from the appropriate Drawings. All dimensional information related to existing facilities shall be taken from actual measurements made by the Contractor on the Site.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the Contract Documents.

1.04 DEFINITIONS

A. Concealed: Concealed areas are those areas that cannot be seen by building occupants.

B. Exposed: Exposed areas are all areas that are exposed to view by building occupants, including areas below counter tops, inside cabinets and closets, inside all equipment rooms, and areas outside the building exterior envelope, exposed to the outdoors.

1.05 QUALITY ASSURANCE

A. Regulations: Work, materials and equipment shall comply with the latest rules and regulations specified in National Fire Protection Association (NFPA).

B. Discrepancies: The Drawings and Specifications are intended to comply with listed codes, ordinances, regulations and standards. Where discrepancies occur, immediately notify the Owner's Project Manager in writing and ask for an interpretation. Should installed materials or workmanship fail to comply, the Contractor is responsible for correcting the improper installation at no additional cost to the Owner. Additionally, where sizes, capacities, or other such features are required in excess of minimum code or standards requirements, provide those specified or shown.

C. Contractor Qualifications: An acceptable Contractor for the Work under this Division must have personnel with experience, training and skill to provide a practical working system. The Contractor shall furnish acceptable evidence of having installed not less than three systems of size and type comparable to this Project. All personnel installing equipment under this Division shall possess valid licenses for their skill level. Each Journeyman shall supervise no more than two apprentice helpers. Refer also to Owner's Special Conditions.

1.06 LEED AND SUSTAINABILITY

A. Product Data for Credit IEQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content.

B. Laboratory Test Reports for Credit IEQ 4: For adhesives and sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Submit MSDS sheets showing compliance with Section 01 81 13 - Sustainable Design Requirements.

D. Sealants shall meet the requirements of SCAQMD r1168 and CDPH v1.1-2010 for emissions

E. Paints/Coating shall meet the requirements of SCAQMD r1113 for coatings and CDPH v1.1-2010 for emissions.

F. Insulation shall contain no added formaldehyde and be certified with CDPH v1.1-2010 for emissions

1.07 SUBMITTALS

A. Product Data: Provide coordination Drawings with submittals as required by Division 01.

B. Record Documents: In addition to hard copy format, all material submitted as final record products, including approved Shop Drawings and submittals, shall be submitted to the Owner in its original electronic file format on compact disc or DVD. Material may be scanned into electronic file format where necessary.

1.08 DELIVERY, STORAGE AND HANDLING

A. All equipment and materials shall be delivered to the Project Site clean and sealed for protection.

B. Moisture: During construction, protect switchgear, transformers, motors, control equipment, and other items from insulation moisture absorption and metallic component corrosion by appropriate use of strip heaters, lamps or other suitable means. Apply protection immediately upon receiving the products and maintain continually.

C. Damage: Take such precautions as are necessary to protect apparatus and materials from damage. Failure to protect materials is sufficient cause for rejection of the apparatus or material in question.

D. Finish: Protect factory finish from damage during construction operations until acceptance of the Project. Restore any finishes that become stained or damaged to Owner's satisfaction.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Equipment and control systems should match, integrate, communicate or cooperate with other systems such as power monitoring systems, building automation, fire alarm, motor control centers, switchgears, breakers, transformers, and lighting dimming systems.

C. Conditions: Provide new products of manufacturers regularly engaged in production of such equipment. Provide the manufacturer's latest standard design for the type of product specified. Products shall be U.S. made. Owner reserves the right to approve or disapprove foreign-made products.

D. NEC and UL: Products shall conform to requirements of the National Electrical Code. Where Underwriters' Laboratories have set standards, listed products and issued labels, products used shall be listed and labeled by UL.

E. Space Limitations: Equipment selected shall conform to the building features and shall be coordinated with all components. Do not provide equipment that will not meet arrangement and space limitations. Contractor shall submit room layouts with submitted items shown drawn to scale. Submittals will be rejected without floor plan Drawings showing submitted items.

F. Factory Finish: Equipment shall be delivered with a hard surface, factory-applied finish so that no additional field painting is required except for touch-up.

G. Series Ratings: Overcurrent devices shall have fully rated interrupting capacity. Series rating of devices is unacceptable.

2.02 EQUIPMENT AND DEVICE MARKING

A. Designations: Externally mark all equipment, devices, feeders, branch circuits and similar items with nameplates with the same designations as indicated on the Contract Documents.

B. Nameplates shall be black laminated rigid phenolic with white core. Nameplate minimum size shall be 1 inch high by 3 inches long with 3/16 inch high engraved white letters. Supply blank nameplates for spare units and spaces.

C. Nameplate Fasteners: Fasten nameplates to the front of equipment only by means of stainless steel self-tapping screws. Stick-ons or adhesives are not acceptable unless the NEMA enclosure rating is compromised, then only epoxy adhesive shall be used to attach nameplates.

D. Nameplate Information: The general naming convention shall consist of the following segments:

1. Building name in abbreviated form where equipment is located;
2. Building floor where electrical equipment is located;
3. System voltage: H (277/408V) or L (120/208V).

4. Individual equipment identification: A, B, C, etc.

E. In general, provide the following information for the types of electrical equipment as listed:

1. Switchgears, Switchboards, Distribution Panels and Motor Control Centers: On mains, identify the piece of equipment, the source, and voltage characteristics (i.e., 480/277\/ 3PH 4W). For each branch circuit protective device, identify the load served.

2. Transformers, Individual Starters, Contactors, Disconnect Switches, Transfer Switches and Similar Equipment: Identify the device designation, voltage characteristics source and load served.

3. Panelboards: Identify panelboard designation, voltage characteristics, and source designation.

F. Panelboards: Prepare a neatly typed circuit directory behind clear heat-resistant plastic in a metal frame tack welded to the inside of the door for each panelboard. Identify circuits by equipment served and by building room numbers where room numbers exist. Indicate spares and spaces with light, erasable pencil marking. Adhesive mounted directory pocket is not acceptable. Removing and attaching panel schedules from the Drawings is not acceptable.

G. Panelboards, Pull, Junction and Outlet Boxes:

1. With ½ inch high permanent lettering, identify conduits connected to panelboards, pull, junction and outlet boxes with the complete circuit number of the conductors contained therein. Neutral conductors shall be identified by wire marker tags in the panelboards, pull, junction and outlet boxes. Where multiple circuits are contained in a box, identify the circuit conductors with permanent tags which indicate circuit designation.

H. Power receptacles, wall switches and dedicated outlets. Identify circuits as per Specification Section 26 27 26.

I. Dedicated outlets: Dedicated is understood to be specific equipment listed by equipment number in the panel schedules or identified on the Drawings. Dedicated also includes computer outlets.

J. Remote Ballasts: For remote ballasts not within five (5) feet of their associated lighting fixture, provide appropriate permanent lettering on both the ballasts and the light fixture to identify which are mated to the other.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. Installation shall be in accordance with manufacturer’s published recommendations.

C. Cooperation with Other Trades: Cooperate with trades of adjacent, related or affected materials or operations, and with trades performing continuations of this Work in order to effect timely and accurate placing of Work and to coordinate, in proper and correct sequence, the Work of such trades.

D. Workmanship: Work shall be performed by competent workers skilled in their trade. This installation must be complete.

E. Housekeeping Pads: Unless otherwise noted. Install 3 1/2 inch thick concrete foundation pads for indoor floor-mounted equipment, except where direct floor mounting is required. Pour pads on roughened floor slabs, sized so that outer edges extend a minimum of 3 inches beyond equipment. Trowel pads smooth and chamfer edges to a 1 inch bevel. Secure equipment to pads as recommended by the manufacturer.

F. Setting of Equipment: Equipment must be leveled and set plumb. Sheet metal enclosures mounted against a wall must be separated from the wall not less than 1/4 inch by means of corrosion-resistant spacers or by 3 inches of air for freestanding units. Use corrosion resistant bolts, nuts and washers to anchor equipment. Provide Drawings and layout Work showing exact size and location of sleeves, openings or inserts for electrical equipment in slabs, walls, partitions and chases in sufficient time to be coordinated with Work under other divisions.

G. Sealing of Equipment: Seal openings into equipment to prevent entrance of animals, birds and insects.

H. Motors: Electrical Work includes the electrical connection of all motors, except those that are wired as a part of equipment.

I. Concealed Work: Conceal all electrical Work in walls, floors, chases, under floors, underground, and above ceilings except:

1. Where shown or specified to be exposed. Exposed is open to view.

2. Where exposure is necessary to the proper function.

3. Where size of materials and equipment preclude concealment.

J. Transformers: Use transformers to change the service to the required utilization voltages.

K. Provide final electrical connections to equipment furnished under other divisions and by the Owner. Furnish detailed Shop Drawings of equipment indicating the exact number and location of rough-in points. Such final Shop Drawings may indicate adjustments in total number and exact location of rough-in points, and in equipment dimensions. Making adjustments to field conditions is considered a part of the Work required.

1. Roughing-in: When roughing-in electrical branch circuits to various items of equipment, terminate at proper points as indicated on detailed equipment Shop Drawings or as directed by Owner. Do not rely on Drawings accompanying these Specifications for rough-in locations, only for general routing of circuiting.

L. Refer to Divisions 07 and 09 for sealing and firestopping requirements where raceways penetrate smoke, fire, and sound rated walls.

M. All unused openings such as but not limited to, knockouts on panels and boxes, surface wireway openings, busway openings, circuit breaker empty slots shall be covered with approved cover plates.

N. Temporary power equipment and distribution for construction shall not occupy building spaces or block pathways that are designated for permanent installation of other trades according to design drawings.

3.02 TESTING

A. Test Conditions:

1. Place circuits and equipment into service under normal conditions, collectively and separately, as may be necessary to determine satisfactory operation. Perform specified tests in the presence of the Owner's representative(s). Furnish all instruments, wiring, equipment and personnel required for conducting tests. Demonstrate that the equipment operates in accordance with requirements of the Contract Documents. Special tests on certain items are specified hereinafter.

2. Where specified that the testing be performed by an independent testing company, an Owner-approved National Electrical Testing Association (NETA) certified testing company shall be used. Submit copies of test reports.

3. Prior to testing, Contractor shall submit to Owner for approval, installation verification Prefunctional Checklists and Functional Performance Test procedures. These shall be used for documentation as part of the commissioning process.

4. All instruments required for conducting the tests shall be NIST (National Institute for Standard and Technology) certified or traceable, and calibrated at the time of testing.

B. Test Dates: Schedule final acceptance sufficiently in advance of the Contract date to permit completion of any necessary adjustment or alterations within the number of days allotted for completion of the Contract. Provide written notification to Owner at least fourteen (14) calendar days in advance of Functional Performance Test dates.

C. Retests: If retesting is required due to initial failure, conduct retests of such time duration as may be necessary to assure proper functioning of adjusted or altered parts or items of equipment. Any resultant delay as a result of such necessary retests does not relieve the Contractor of Contractor’s responsibility under this Contract.

D. Circuit Verification: All 120-volt single-phase circuits shall be verified to match the Drawings and panel schedules by “ringing out" each circuit in the presence of the Owner’s representative(s).

E. Refer to Commissioning Specification Sections for additional start-up, prefunctional and operational checkout, and for functional performance test procedures.

END OF SECTION 26 01 00

26 05 02

OPERATION AND MAINTENANCE MANUALS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. This section provides for the preparation and submission of operation and maintenance manuals.

B. Each section included in Divisions 26 - Electrical incorporates this section by reference and is incomplete without the provisions stated herein.

1.02 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.03 PREPARATION

A. Furnish four copies of complete operation and maintenance instructions, service manuals and parts list applicable to each manufactured item of equipment furnished. Bind operation and maintenance information in four separate loose-leaf binders and deliver to A/E at least four weeks prior to final review of the project.

B. Organize binders to contain like equipment in separate divisions. Provide a complete double index for each binder to include:

1. An alphabetized list of the products by name.

2. An alphabetized list of manufacturers whose products have been incorporated in the work together with their addresses and the name, addresses and telephone numbers of the local sales representative or supplier.

C. For each section of product, equipment or system, organize the data as follows:

1. Furnish a general description of the equipment or system listing the major components, intended service and other general data.

2. Furnish technical data including nameplate data, design parameters, ratings, capacity, performance data, operating curves, characteristics, and the like. Clearly distinguish between information which does and does not apply.

3. List warnings and cautions to be observed during both installation and operations.

4. Fully detailed installation and operation instructions including special tools required, alignment instructions, start up, and shut down sequences.

5. Furnish maintenance, service and repair instructions including maintenance and service schedules, materials, and methods for performing routine and annual service.

6. Furnish a troubleshooting guide and check list indicating common failures, test methods and procedures for determining component fault or failure.

7. Furnish a spare parts list indicating part and order number with name, address, and telephone number of supplier. Include current prices of replacement parts and supplies.

8. Furnish diagrams including controls, wiring, installation or operation of the equipment or system.

9. Furnish copies of all approved submittals. Refer to Section 26 05 01.

10. Furnish copies of the results of the preventative maintenance service.

11. Print copies of the "AS-BUILT" drawings. Refer to Section 26 05 00.

12. Furnish all warranties and guarantees.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Note Used

END OF SECTION 26 05 02

SECTION 26 05 19 - CABLE, WIRE AND CONNECTORS, 600 VOLT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. This Section specifies the requirements for 600-volt cable, wire and connectors. It consists of but is not limited to power distribution circuitry, control system circuitry, lighting circuitry, appliance, equipment and motor-branch circuitry and outdoor power and lighting circuitry.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. NEMA WC 3: Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

2. NEMA WC 5: Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

3. Where application of National Electrical Code, appears to be in conflict with the requirements of this section, the Owner shall be asked for an interpretation.

1.04 SUBMITTALS

A. Product Data:

1. Submit manufacturer's data on cable and wire connectors.

1.05 DELIVERY, STORAGE AND HANDLING

A. Provide factory-wrapped waterproof flexible barrier material for covering wire and cable wood reels, where applicable; and weather resistant fiberboard containers for factory-packaging of cable, wire and connectors, to protect against physical damage in transit. Damaged cable, wire or connectors shall be removed from the Project Site.

B. In their factory-furnished coverings, store cable, wire and connectors in a clean, dry indoor space which provides protection against the weather.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Provide factory-fabricated wire of the size, rating, material and type as indicated for each service. Where not indicated, provide proper selection as required to comply with installation requirements and with NEC standards. The minimum size wire to be used for power or lighting circuits shall be #12 copper stranded with insulation as noted below. Minimum size for control circuits shall be #14 copper stranded.

2.02 MANUFACTURERS

A. Interstate Wire Company.

B. American Insulated.

C. Okonite.

D. Southwire.

E. Encore Wire.

2.03 BUILDING WIRE

A. NEMA WC 70 – Nonshielded 0-2kV Cables

B. Feeders and Branch Circuits Larger than 10 AWG: 98 percent conductivity copper, stranded conductor, 600-volt insulation, THHN/THWN. Use XHHW insulation for all isolated power circuits.

C. Feeders and Branch Circuits 10 AWG and smaller: 98 percent conductivity copper conductor, 600-volt insulation, THHN/THWN solid conductor. Use XHHW insulation for all isolated power circuits.

D. Control Circuits: 98 percent conductivity copper, stranded conductor, 600 volt insulation, THHN, THWN.

E. Color Coding:

1. Branch Circuit and Feeders:

	280Y/120 Volts	480Y/277 Volts	120/240 Volts
Phase A	Red	Brown	Black
Phase B	Black	Yellow	Red
Phase C	Blue	Purple	----
Neutral	White with tracer	Gray with tracer	White with tracer
Ground	Green	Green	Green

2. The above colors shall be used unless requirements of code require different colors. When connecting to existing circuits, existing color coding shall be utilized. The neutral tracer color shall match the phase conductor color that it is associated with. Lighting circuits with shared grounding conductor are not required to have tracer colors on the wire.

3. Secondary conductors from isolation transformers shall be: Conductor 1-orange and conductor 2-brown.

4. Conductors No. 8 AWG and larger shall be identified by colored plastic tape that marches the circuit phase color at all visible points when colored insulation is unavailable. Colored tape shall be located and of such a quantity to readily indicate the conductor phase.

F. Type MC cable assemblies shall be permitted only **with Owner's prior written approval** and with proper cable management.

2.04 REMOTE CONTROL AND SIGNAL CABLE

A. Control Cable for Class 1 Remote Control and Signal Circuits: 98 percent conductivity copper conductor, 600-volt insulation, rated 60 degrees C, individual conductors twisted together, shielded and covered with a PVC jacket.

B. Control Cable for Class 2 or Class 3 Remote Control and Signal Circuits: 98 percent conductivity copper conductor, 300-volt insulation, rated 60 degrees C, individual conductors twisted together, shielded and covered with a nonmetallic jacket; UL listed for use in air handling ducts, hollow spaces used as ducts, and plenums.

PART 3 - EXECUTION

3.01 PREPARATION

A. Installer must examine the areas and conditions under which cable, wire and connectors are to be installed and notify the Contractor and Owner in writing of conditions detrimental to the proper and timely completion of the work.

B. Inspect wire and cable for physical damage. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. General wiring methods:

1. Install electrical cable, wire and connectors as indicated, in accordance with the manufacturer's written instructions, the applicable requirements of NEC, and as required to ensure that products serve the intended functions.

2. Coordinate cable and wire installation work with electrical raceway and equipment installation work, as necessary for proper interface.

3. Cables shall be selected on the basis of their purpose and UL listing. Generally, use Types THWN, XHHW and THNN in building interiors and other dry locations. Outdoors and in underground in raceways, use Type THWN or THHN. Conductors subject to abrasion, such as in lighting poles, shall be Type THWN or THHN.

4. No conductor smaller than No. 12 wire shall be used for branch circuit wiring. In the case of "homeruns" over 50 feet in length (100 feet for 277 volt), no conductor smaller than a No. 10 wire shall be used. The tap conductor from the J-box in the ceiling to the receptacle may be No. 12. Each 120-volt phase conductor shall have a neutral conductor of the same size. The sizing of all wire except remote control wire shall be accomplished in the case of both feeder and branch circuits by conforming to the following provisions. Only lighting circuits may share grounding conductors. All lighting circuits with shared grounding conductors shall be #10 AWG minimum.

    a. 480 Volt Branch Circuits: The voltage drop in the case of 277/480 volt circuits shall not exceed 1.0 percent at maximum load and 70.0 percent power factor.

    b. 120/208 Volt Branch Circuits: The voltage drop in the case of 120/208 volt circuits shall not exceed 2.0 percent at maximum load and 70.0 percent power factor.

5. Remote control wires shall be no smaller than No.12 AWG stranded copper conductors and shielded with drain. Control wires shall be run in separate conduits. Departures from the sizes so determined shall be made only in those cases in which the National Electrical Code requires the use of larger conductors. The sizes as determined from these tables shall be regarded as the acceptable minimum under all other circumstances. In no case, however, shall there be a voltage drop greater than that specified in any feeder or branch circuit. This voltage drop shall be based on the full load, 70 percent power factor, the total impedance drop with 60-hertz alternating current and with the reactance drop in the respective metal conduits duly considered. The Contractor may, if Contractor deems it necessary or advisable, use larger sized conductors than those shown. Under no circumstances, however, shall the Contractor use any conductors sized in a manner which does not conform to the above mentioned tables without having first secured the written approval of the Owner's duly authorized representative.

D. Wiring Installation Raceways:

1. Wire and cable shall be pulled into clean dry conduit.

2. Pull conductors together where more than one is being installed in a raceway.

3. Use UL listed pulling compound or lubricant, when necessary; compound must not deteriorate conductor and insulation. No pulling compound shall be used when pulling isolated power circuits utilizing XHHW insulation.

4. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed. Wires with damaged insulation shall be replaced at no cost to the Owner.

5. Place an equal number of conductors for each phase of a circuit in same raceway.

6. No more than three phase conductors shall be installed in same conduit. Line conductors shall not share the same conduit with load conductors.

E. Wiring Connections and Terminations:

1. Splicing cable or wire is not allowed unless it is explicitly designed by the Engineer, or for equipment connection per equipment manufacturer's recommendation. Where splices are to be implemented, approval of the Owner must be obtained before installation is made. Provide electrical boxes where splices are made.

2. Thoroughly clean wires before installing lugs and connectors.

3. Terminate spare conductors with electrical tape.

F. Field Quality Control:

1. Torque test conductor connections and terminations to manufacturer's recommended values.

2. Perform continuity test on all conductors. Verify proper phasing connections and phase rotation, where applicable.

3. Conductors in vertical conduits or raceways shall be supported in the manner set forth in the appropriate section of the latest revision of the National Electrical Code. Lighting fixtures shall not be used for raceways for circuits other than series wiring of fixtures.

4. Conductors may be run parallel on sizes 1/0 to 500 kcMIL inclusive provided all parallel conductors are the same size manufacturer, length and type of insulation. Except as otherwise shown on Drawings, no more than three (3) conductors may be run in parallel, and they shall be so arranged and terminated as to ensure equal division of the total current between all conductors involved. Where parallel connection is contemplated, approval of the Owner must be obtained before installation is made.

3.03 TESTING

A. Before final acceptance, the Contractor shall make voltage, insulation and load tests, necessary to demonstrate to the Owner the satisfactory installation and proper performance of all feeder circuits.

B. Test feeder conductors to determine the conductors are clear of faults, high resistance connections and megger test same at 600 volts DC. Test results below 30 megaohms shall be cause for rejection of the wiring installation. Replace and retest all such rejected conductors.

END OF SECTION 26 05 19

SECTION 26 05 26 - GROUNDING AND BONDING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. Ground the electrical service system neutral at service entrance equipment to grounding counterpoise loop. Electrical systems that are grounded shall be connected to earth in a manner that will limit the voltage imposed by lightning, line surges, or unintentional contact with higher-voltage lines and that will stabilize the voltage to earth during normal operations. Provide a completely grounded system in accordance with Article 250 of the NEC.

B. Metal water piping system(s) installed in or attached to a building or structure shall be bonded to the service equipment enclosure, the grounded conductor at the service. Where installed in or attached to a building or structure, a metal piping system(s), including gas piping, that is likely to become energized shall be bonded to the service equipment enclosure, the grounded conductor at the service. The bonding jumper(s) shall be sized in accordance with Article 250 of the NEC.

C. Ground each separately-derived system neutral to separate ground buses that are installed in nearest electrical rooms. Transformers, inverters, or other power supplies that are separately derived systems.

D. Concrete reinforcing bars shall be permitted for grounding. Connect the structural metal frame to the reinforcing bars of concrete-encased electrode. Concrete-encased electrodes of existing buildings or structures shall not be required to be part of the grounding electrode system where the steel reinforcing bars or rods are not accessible for use without disturbing the concrete.

E. Provide communications system-grounding conductor at point of service entrance and connect to Telecommunications Main Grounding Busbar (TMGB). Bond together the communications system grounding.

F. Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, metal cable trays, auxiliary gutters, meter fittings, boxes, cable armor, cable sheath, ground bus in electrical rooms, metal frame of the building or structure, ground ring, lightning down lead conductor, grounding conductor in raceways and cables, receptacle ground connectors, and metallic plumbing systems.

G. Common Ground Bonding with Lightning Protection System: Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

H. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All design, materials, installation and testing pertaining to grounding and bonding system shall comply with the latest edition of applicable requirements and standards addressed within the following references:

1. ANSI/IEEE Standard 142 - Recommended Practices for Grounding of Industrial and Commercial Power Systems.

2. UL 467 - Grounding and Bonding Equipment.

3. IEEE 81 - Guide for Measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Ground System.

4. IEEE 1100 - Recommended Practice for Powering and Grounding Electronic Equipment (IEEE Emerald Book).

5. NFPA 70 - National Electrical Code (NEC).

6. NFPA 780 - Standard for the Installation of Lightning Protection Systems.

7. LPI (Lightning Protection Institute) 175- Standard of Practice for the Design - Installation - Inspection of Lightning Protection Systems.

8. UL 96 - Lightning Protection Components.

9. UL 96A - Standard for Safety Installation Requirements for Lightning Protection Systems.

10. BICSI Telecommunications Distribution Methods Manual (TDMM), Latest Edition.

11. ANSI J-STD-607-A – Commercial Building Grounding and Bonding Requirements for Telecommunications.

12. IEEE C2 - National Electrical Safety Code (NESC).

13. UL 497 - Protectors for Paired-Conductor Communications Circuits.

14. UL 497A - Secondary Protectors for Communications Circuits.

15. UL 497B - Protectors for Data Communications and Fire-Alarm Circuits.

16. UL 1449 - Standard for Safety Surge Protective Devices.

1.04 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:

1. Product Data: For the following:

    a. Ground rods.

1.05 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

    1. Comply with UL 467.

B. Comply with NFPA 70; for overhead-line construction and medium-voltage underground construction, comply with IEEE C2.

C. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.02 MATERIALS AND EQUIPMENT

A. Grounding system components shall be as required to comply with the design and construction of the system indicated. Components shall be as indicated in manufacturer's submittal data.

B. Ground Conductors:

    1. Materials:

        a. Provide 600-volt insulated conductors having a green-colored insulation for grounding electrode and equipment grounding conductors. Use stranded conductors.

        b. Conduit grounding conductors shall be insulated copper conductor, green in color to size #6 AWG. Insulated conductors larger than #6 AWG shall be same as phase conductors but identified with green tape at each accessible opening or location in raceway.

        c. Provide bare conductors for bonding jumpers.

C. Connections:

    1. Materials:

        a. Unless otherwise noted, for below-grade connections provide exothermic welded type except those at test wells.

b. For above-grade connections provide mechanical bolted-type connections utilizing high conductive copper alloy or bronze lugs or clamps.

c. Where required, provide plated connectors that will not cause electrolytic action between the conductor and the connector.

d. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.

D. Grounding clips shall be O-Z Gedney, Steel City (Thomas & Betts) Type G.

E. Grounding Electrodes:

1. Grounding electrodes shall not be smaller than ¾-inch diameter, with minimum length ten (10) feet.

2. Grounding electrodes shall be copper-clad steel for corrosion protection.

F. Grounding Busbar:

1. Where a field-provided ground bus or ground bar is required, use round-edge copper bar with 98 percent International Annealed Copper Standard (IACS) conductivity.

2. Size the bus for not less than 25 percent of the cross-sectional areas of the related feeder. A minimum size of ¼-inch thick by 2-inch depth by 6-inch length (minimum) is required.

a. The ground bar shall be a predrilled copper busbar provided with standard NEMA bolt hole sizing and spacing for the type of connectors to be used.

b. The ground bar shall be tin-plated for reduced contact resistance.

c. The ground bar shall be insulated from its support. A minimum of 2 inches separation is required. Mount the grounding busbars on insulated standoffs to ensure isolation from ground potential or stray potentials.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installations shall be in accordance with manufacturer's published recommendations.

C. Install ground system as indicated, in accordance with the applicable requirements of the NEC. Coordinate installation of grounding and lightning protection system components with structural and civil Drawings and placement of building structure.

D. Install grounding conductors continuous, without splice or connection, between equipment and grounding electrodes.

E. Size: When grounding and bonding conductors are not sized on Drawings, size the grounding conductors in accordance with NEC. Size bonding jumper so that minimum cross-sectional area is greater than or equal to that of the equivalent grounding conductor as determined from NEC.

F. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.

1. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.

2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.

G. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

H. Connect grounding electrode conductors to metal water pipe using suitable ground clamp. Make connections to flanged piping at street side of flange. Provide bonding jumper around water meter to electrically bypass.

I. Exothermic welding shall be utilized for ground connections where they are concealed, or inaccessible.

J. Strap grounding clamps shall not be used. A connection requiring bolting shall be made up with Monel metal bolts, washers and nuts. Connections shall be made only after surfaces have been cleaned, or ground to expose virgin metal.

K. Supplementary Grounding Electrode: Use effectively grounded metal frame of the building.

L. Provide grounding and bonding at Utility Company's metering equipment in accordance with Utility Company's requirements.

M. Conduit and raceway systems shall not be considered a ground path. Provide an internal insulated grounding conductor in all conduits and raceways. Size grounding conductors in accordance with the NEC. Where grounding conductor sizes are shown in excess of code requirements, provide conductor sizes as indicated.

N. In feeder and branch circuits, provide a separate, green, insulated equipment-grounding conductor with the circuit conductors. Terminate each end of the grounding conductor on a grounding lug, bus, or bushing.

O. Ground each outlet by the use of an approved grounding clip attached to the junction box in such a position to be readily inspected on removal of the cover plate, or by the use of an approved grounding yoke type receptacle.

P. Install an insulated grounding conductor internally to all flexible metal conduits. All flexible metal conduit containing power circuits shall utilize grounding bushings. The grounding bushing shall contain a bonding jumper and shall be terminated at the equipment ground bus. The grounding conductor shall terminate at the equipment ground bus. Install external ground wire on liquid tight flexible metal conduit. Provide suitable grounding bushing at each end of liquid tight flexible metal conduit at transformers. External ground wire shall be in addition to grounding conductors installed internal to raceway system.

Q. Where accessible, conductor connections shall be made by means of solder-less connectors such as serrated bolted clamps or split bolt and nut type connectors.

R. Gas pipes shall not be used as a grounding electrode. Gas pipes shall not be used as a grounding electrode. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.

S. Install one test well for each service at the ground rod electrically closest to the service entrance. Set top of well flush with finished grade or floor.

T. Measure ground resistance from neutral connection at service entrance to ground reference point using suitable grounding testing equipment. Resistance shall not exceed 5 OHMS.

3.02 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.

2. Make connections with clean, bare metal at points of contact.

3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Connections at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped-type connections between conductors and ground rods.

F. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A .

G. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

H. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.03 FIELD QUALITY CONTROL

A. System Neutral: Where a system neutral is used, bond the system neutral to the grounding electrode system in accordance with NEC. Ground the system neutral only at the point of service and isolate it from ground at all other points in the system.

B. Separately Derived Systems: Ground neutrals of separately derived systems such as generators, transformers, etc., in accordance with NEC.

C. The neutral of each transformer shall be bonded to system ground at one point only. This point shall be ahead of the first secondary protective device.

D. Size: Size the system grounding electrode conductors to comply with NEC.

E. Connect grounding electrode conductor pigtails at each grounding electrode to building structural steel, as indicated.

F. Connect main grounding electrode conductor pigtails to power system neutral, as indicated on Drawings.

G. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

H. Testing: Perform the following field quality-control testing:

I. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.

J. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.

K. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

1. Equipment Rated 500 kVA and Less: 10 ohms.

2. Equipment Rated 500 to 1000 kVA: 5 ohms.

3. Equipment Rated More Than 1000 kVA: 3 ohms.

4. Substations and Pad-Mounted Switching Equipment: 5 ohms.

5. Manhole Grounds: 10 ohms.

L. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Owner representative promptly and include recommendations to reduce ground resistance such as a chemical ground system or others that are available and approved by the Consulting Engineer.

3.04 GRADING AND PLANTING

A. Restore surface features, including vegetation, at areas disturbed by Work of this Section. Reestablish original grades, unless otherwise indicated. If sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include application of topsoil, fertilizer, lime, seed, sod, sprig, and mulch. Comply with Section 32 90 00 - "Planting." Maintain restored surfaces. Restore disturbed paving as indicated.

3.05 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

A. Manholes and Handholes: Install a driven ground rod close to wall and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide a No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

B. Connections to Manhole Components: Connect exposed-metal parts, such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

C. Pad-Mounted Transformers and Switches: Install two ground rods and counterpoise circling pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Use tinned-copper conductor not less than No. 2 AWG for counterpoise and for taps to equipment ground pad. Bury counterpoise not less than 18 inches below grade and 6 inches from the foundation.

3.06 EQUIPMENT GROUND

A. Manholes:

1. Provide a No. 1/0 AWG bare stranded copper ground bus in all manholes. Mount bus 12 inches above floor using one-hole pipe straps three (3) feet on center.

2. Connect bus to ground rod with a No. 1/0 AWG conductor. Bond all metallic components and electrical grounding conductors to the bus using lugs or clamps.

B. Transformer Rooms, Electric Rooms, Switchgear Rooms:

1. Provide 4/0 copper ground wire loop in each room for bonding and grounding.

2. Mount ground loop 12 inches below suspended ceiling or structural ceiling and around the perimeter of room.

3. Connect ground loop to vertical ground bus (cable) riser grounding plate. Bond all non-current carrying metallic parts of electrical equipment in the room to the ground loop by bonding jumper(s) sized in accordance with Article 250 of the NEC.

4. Raceway Systems and Equipment Enclosures:

5. Ground cabinets, junction boxes, outlet boxes, motors, controllers, raceways, fittings, switchgear, transformer enclosures, other electrical equipment and metallic enclosures. Ground equipment and enclosures to the continuous-grounded metallic raceway system in addition to any other specific grounding shown.

6. Provide bonding jumpers and ground wire throughout to ensure electrical continuity of the grounding system,

7. Provide grounding-type insulated bushings for metal conduits 1-1/2 inches and larger terminating in equipment enclosures containing a ground bus and connect the bushing to the ground bus.

8. Provide a green insulated equipment-grounding conductor for each feeder and branch circuit.

C. Taps and Connections: Make grounding (earth) conductor approximately 2 inches longer than the ungrounded (phase) conductors at both ends.

END OF SECTION 26 05 26

26 05 29 - SUPPORTING DEVICES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Supporting devices, including:
   1. Conduit and equipment supports.
   2. Fastening hardware.

1.02 COORDINATION

A. Coordinate size, shape and location of concrete pads with section on cast-in-place concrete.

1.03 QUALITY ASSURANCE

A. Provide support systems adequate for weight of equipment and conduit, including wiring which they carry.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. B-Line.

B. Kindorf.

C. Unistrut.

2.02 MATERIAL

A. Support Channel: Galvanized or painted steel.

B. Hardware: Galvanized or painted steel.

C. Spring steel clips.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion anchors, beam clamps or bolts.

B. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; sheet metal screws in sheet metal studs and wood screws in wood construction.

C. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.

D. Do not use powder-actuated anchors on new concrete structure.

E. Do not drill structural steel members.

F. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

G. Provide concrete pads and equipment bases for all outdoor equipment on grade, floor mounted equipment, areas with floors below grade, penthouse equipment rooms and where shown on Drawings.

H. Install surface-mounted cabinets and panelboards with minimum of four anchors.

I. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.

J. Do not support conduit from ceiling wire supports.

K. Do not use spring steel clips and clamps or support conduits by individual hanger wires.

L. Where multiple runs of conduit can be run grouped together, run conduit in racks supported from the building structure. Provide for future use of rack by properly planning routing of conduits in and through restricted areas such as through walls and around mechanical and electrical equipment.

M. Use spring steel clips with EMT for individual branch circuits and device boxes in drywall construction.

END OF SECTION

SECTION 26 05 33 - RACEWAYS, CONDUITS, AND BOXES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. This Section specifies the requirements for raceways, conduits and boxes.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. ANSI C80.1 - Rigid Steel Conduit, Zinc-Coated.
2. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.
3. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
4. ANSI/NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports.
5. ANSI/UL 1 - Flexible Metal Conduit.
6. ANSI/UL 5 - Surface Metal Raceways and Fittings.
7. ANSI/UL 360 - Liquid-tight Flexible Steel Conduit.
8. ANSI/UL 467 - Electrical Grounding and Bonding Equipment.
9. ANSI/UL 797 - Electrical Metallic Tubing.
10. ANSI/UL 870 - Wireways, Auxiliary Gutters and Associated Fittings.
11. ANSI/UL 884 - Underfloor Raceways and Fittings.
12. NEMA VE I - Metallic Cable Tray Systems.
13. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
14. UL - Rigid Metal Conduit.
15. ANSI/UL 651 - Schedule 40 and 80 Rigid PVC Conduit.

1.04 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.05 SUBMITTALS

A. Product Data:

1. Submit manufacturer's product data for raceways, conduits, outlet boxes, and wireways.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.02 WIREWAYS AND TERMINAL BOXES

A. Wireways and terminal boxes shall be of steel construction, oil-tight with knockouts.

B. Size shall be minimum 4 x 4 inches or as indicated on the Drawings.

C. Cover shall be hinged.

D. Fittings shall be so constructed to continue the ”lay in" feature throughout the entire installation.

E. Provide all sheet metal parts with a rust-inhibiting phosphatizing primer coating and finished in gray enamel. All hardware shall be cadmium plated to prevent corrosion.

F. Inside Terminal Boxes: Provide 25-ampere, 300-volt industrial rated terminal blocks with marking strip. Mark strip with black ink identifying circuit connection. Provide nameplate on exterior of each terminal box indicating panelboard served.

2.03 CONDUIT AND FITTINGS

A. Manufacturers:

1. Conduit and Electrical Metallic Tubing:

a. Allied Tube & Conduit or equal.

2. Fittings:

a. Appleton Electric

b. Midwest Electric Products

c. O-Z/Gedney.

3. Expansion Fittings:

a. O-Z/Gedney Type DX

b. Crouse-Hinds Type XC

c. equal by Midwest Electric Products or Appleton Electric.

4. Flexible Metal Conduit and Fittings:

    a. Anaconda Sealtite, Type UA.

B. Application:

1. Conduit and fittings for all electrical systems on this Project shall include the following:

    a. Service entrance.

    b. Electrical power and lighting feeders.

    c. Electrical power and lighting circuits.

    d. Building automation systems (BAS).

    e. Fire alarm and signaling systems.

    f. Telecommunications rough-in system (minimum 6-inch bending radius for telecommunications conduits).

    g. Security systems.

    h. Other electrical systems, as identified on the Drawings.

C. For each electrical wireway system indicated, provide a complete assembly of conduit, tubing or duct with fittings including, but not necessarily limited to, connectors, nipples, couplings, locknuts, bushings, expansion fittings, and other components and accessories as needed to form a complete system of the type indicated.

D. Conduit fittings shall be designed and approved for the specific use intended. Conduit fittings, including flexible, shall have insulated throats or bushings. Rigid conduits shall have insulated bushings, unless grounding bushings are required by NEC Article 250-28. Grounding bushings shall have insulated throats.

E. Rigid metal conduit shall be hot-dipped galvanized. Fittings shall be threaded type. Expansion fittings shall be OZ Type DX.

F. Electrical metallic tubing shall be galvanized. Fittings shall be all steel set screw deep socket UL marked and approved for the application. Compression fittings uses shall be in, not limited to, wet damp and environmental areas type. Expansion fittings shall be OZ Type TX.

G. Flexible metal conduit and fittings shall be zinc-coated steel.

H. Liquid-tight flexible conduit and fittings shall consist of single strip, continuous, flexible interlocked, double-wrapped steel, galvanized inside and outside, forming smooth internal wiring channel with liquid-tight covering of flexible polyvinyl chloride (PVC). It shall be furnished with a sealing O-ring where entering an enclosure subject to moisture. Where O-Rings are used, ground type bushings shall be used in the box or enclosure.

I. Crimp type fittings are not acceptable.

J. Raceways such as electrical nonmetallic tubing (ENT) and liquid-tight flexible nonmetallic conduit (LFNC) are not acceptable for use on any Project.

2.04 WALL AND CEILING OUTLET BOXES

A. Manufacturers:

1. Appleton Electric

2. RACO-Hubbell

3. Thomas & Betts – Steel City

4. Cooper Crouse-Hinds.

B. Galvanized steel interior outlet wiring boxes of the type, shape and size, including depth of box, to suit each respective location and installation; constructed with stamped knockouts in back and sides, and with threaded holes with screws for securing box covers or wiring devices. Minimum switchbox depth shall be 2 inches. Outlet boxes for electrical power shall be 2-1/8 inches deep. Outlet boxes for communication (voice and data) shall be minimum 3-1/2 inches deep.

1. Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes.

2. Accessories shall be compatible with outlet boxes being used and shall meet requirements of individual situations.

C. Corrosion-resistant cast-metal weatherproof exterior outlet wiring boxes of the type, shape and size, including depth of box, with threaded conduit ends, cast metal faceplate with spring-hinged waterproof cap and corrosion-proof fasteners.

D. Outlet boxes in poured concrete shall be plenum type without holes and with reset knockouts. Where extension rings are used to offset conduit between wall reinforcing steel, joint between extension ring and box shall be sealed to prevent concrete from entering box during pour.

2.05 FLOOR BOXES

A. Manufacturers:

1. RACO-Hubbell

2. Wiremold

3. FSR.

B. Boxes shall be NEMA OS 1, fully adjustable, minimum 1-1/2 inch depth for electrical power only; 4-1/2 inch minimum depth for communication.

C. Boxes shall conform to regulatory requirements for concrete-tight floor boxes.

D. Service fittings shall be as specified on Drawings.

E. Poke-thru box fittings shall maintain a minimum two-hour fire rating.

2.06 PULL AND JUNCTION BOXES

A. Boxes shall be galvanized sheet metal with screw-on cover and welded seams, stainless steel nuts, bolts, screws and washers.

B. Boxes larger than 12 inches in any dimension shall be panelboard code gauge galvanized steel with hinged cover.

C. Boxes shall be sized In accordance with NEC.

D. ALL OUTDOOR BOXES AND ENCLOSURE USED IN LAGOON/PIER SHALL BE NEMA 6P RATED. NO EXCEPTIONS.

2.07 SURFACE METAL RACEWAYS

A. Manufacturers: The Wiremold Company 3000 or 4000 Single-Channel System. Systems of other manufacturers may be considered equal if they meet all performance standards as specified herein. Wiremold 4000 shall be used for communication applications.

B. Raceway base and cover sections shall be UL Listed, manufactured of cold rolled steel, and finished in gray enamel.

1. Raceway shall be a two-piece design with a metal base and a snap-on metal cover.

C. Furnish with all entrance fittings, elbows, end caps, covers, and device brackets and plates as indicated on the Drawings for a complete system.

1. Fittings shall be finished in enamel to match the raceway.

2. Fittings shall be supplied with a base where applicable to eliminate mitering.

D. Provide couplings, elbows, connectors, boxes, extension rings and outlet covers specifically designed for use with surface raceway system.

E. Provide factory fittings for vertical raceway riser connection to horizontal raceway runs. Such directional change fittings must accommodate required radius flex for Category 6a communication cable under both load and no load conditions.

F. All internal exposed surfaces within the raceway, including joints and covers shall be free of nicks, cuts, sharp edges, and other imperfections.

G. Grommets shall be used to accommodate building automation system cabling to critical equipment or as noted on Drawings.

H. Multiple raceways shall be provided for normal power, emergency power, and communication / critical alarm as noted on the Drawings.

1. Raceway lengths shall be as shown on the Drawings.

I. Multi-Outlet Assembly Devices:

1. Provide hospital grade, duplex receptacles mounted 12 inches on center unless noted otherwise. Unless otherwise noted, alternate circuits between receptacles.

2. In laboratory applications, normal power receptacles shall have alternating colors for different circuits:

a. Phase A = gray

b. Phase B = brown

c. Phase C = white

3. Exceptions to the color would be single circuit raceway, which shall be white.

4. Receptacles serving emergency circuits shall be red in color.

5. Isolated ground receptacles shall be orange in color.

PART 3 - EXECUTION

3.01 INSTALLATION - GENERAL

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. Concrete metal hit anchor and fastener is an unacceptable fastening system for concrete, brick and block.

D. Where raceways penetrate fire-rated floors, sleeve and seal opening around raceway with UL listed firestop equal to fire rating of floor. Seal penetrations through all floors to provide and maintain a watertight installation. Conduit sleeves, where required, shall be two (2) trade sizes larger for proper sealing and extend 2 inches above the surface. Refer to Section 07 84 13 Penetration Firestopping and Section 09 29 00 Gypsum Drywall for sealing and firestopping requirements where raceways penetrate smoke, fire, and sound rated walls. The installation shall be in compliance with UL listed firestopping assembly.

E. Support all conduits and J-boxes above ceilings from the building structure. All J-boxes being installed above suspended ceilings must have a minimum of 12-inch clearance from the top of the ceiling grid except where approved by the Owner in writing prior to installation.

F. All openings through walls, roof, etc., shall be sleeved.

G. No raceways, metallic or non-metallic, flexible or rigid, shall be installed in any floor slab elevated above slab on grade. The only exception may be for the lighting grid in the parking deck areas of a parking garage.

H. Bushings and throats shall be installed for fittings, raceways, boxes or other enclosures prior to installing cables and wiring systems.

I. Provide raceway support in intervals not exceeding the maximum spacing per NEC.

3.02 INSTALLATION - CONDUIT

A. ALL CONDUIT IN DRIVE STATION BUILDING, RETURN STATION BUILDING, FILTRATION BUILDING AND PIER/WALKWAY IN LAGOON SHALL BE LIQUID TIGHT CONDUIT. NO EXCEPTION.

B. Install raceway and conduit system from point of origin in outlets shown, complete with offsets, pull boxes, junction boxes and fittings.

C. Installation of all new conduits must be minimum 12 inches from ceiling grid except where approved by Owner.

D. No raceway shall be run horizontally inside of walls or partitions. Exceptions: building perimeter walls under windows, clerestory panel walls, and where structural conditions do not allow vertical access to tops of walls. The contractor shall obtain written approval from the Owner for exceptions prior to installation.

E. Install rigid wall hot-dipped galvanized steel conduit. Minimum size shall be 3/4-inch unless noted otherwise on the Drawings. Minimum size for communication shall be 1-inch. The following exceptions are permitted:

1. Electrical Metallic Tubing (EMT): In sizes 3/4-inch up to and including 4 inches, may be used inside dry locations where not subject to mechanical damage. EMT shall be used in air-conditioned spaces, such as accessible ceilings, and dry wall partitions. EMT shall not be used outside, in concrete, underground, in underfloor spaces, in masonry walls and in locations likely to be damp. EMT shall not be used for circuits with system voltage over 480 volts.

2. Liquid-tight Flexible Metal Conduit:

    a. Install liquid-tight flexible metal conduit for connections to rotating, vibrating, moving or movable equipment, including dry-type transformers. Install internal ground wire on flexible conduit with grounding bushings.

3. Flexible Metal Conduit:

    a. Where required, install standard flexible steel metal conduit (not liquid-tight) with internal ground wire, in spaces above ceilings.

    b. Install flexible conduit connection such that vibrations are not transmitted to adjoining conduit or building structure. Maximum length shall be four (4) feet, minimum two (2) feet; minimum size shall be ½-inch.

    c. Communication flexible conduit size in walls shall be minimum 1-inch.

    d. Flexible conduit for lay-in fixtures may be 3/8-inch factory whip assemblies (6 feet maximum).

    e. Flexible conduit for receptacles in office applications can be used in the walls as long as the flexible conduit length does not exceed 12 feet and the flexible conduit run is not horizontal. Where fished in existing walls, the length shall not exceed 12 feet.

4. PVC Conduit:

    a. Utilize PVC conduit for underground outdoor installations, minimum size 1-inch. All PVC conduit runs shall have PVC coated rigid steel stub outs from the ground, including the last 90 degree bend.

    b. All underground PVC conduit shall be installed in concrete with 12-inch x 12-inch x 3-inch concrete markers at every 100 feet and at every turn in direction.

    c. All underground conduits shall be installed with “DANGER – BURIED ELECTRICAL CONDUIT” yellow flagging tape 6-inches above conduit. Continuous above conduit.

F. Multiple Conduit Installation:

1. Install two (2) or more conduits parallel to or at 90 degrees to the structure. Support on metal framing constructed trapeze hangers supported on minimum 3/8-inch diameter all-thread rod attached to the structure with coupling nuts and expansion bolts or beam clamps. Conduit straps or other devices specifically designed for the purpose shall be used to secure conduits to the metal framing. Conduits shall only be installed on the top surface of the metal framing. Wire ties and hanger wires are not permitted. Hanger rods shall not extend more then 1-inch past trapeze hanger.

2. Where parallel conduits are strapped, fastened or anchored, the devices used shall be of the same type and installed on the same plane whether vertical or horizontal.

3. Conduit hangers from drop rod (like Caddy B18 Series) are acceptable only upon prior written approval from the Owner.

G. Single Conduit Installation:

1. Install single conduits parallel to or at 90 degrees to the structure and suspended from the structure on all thread rods (1/4-inch minimum) or clamped and/or clipped to the structure with manufactured clamps/clips. When single conduits are suspended from all thread rods, conduit clamps with bolts and nuts shall be used. Through partition wall penetration shall not be construed as a means of conduit support. Wire ties and hanger wires are not permitted. No powder actuated, compressed air, propane or similar powered “shot” anchor systems shall be installed under any circumstance. Wire ties and hanger wires are not permitted. Single conduits may be secured as follows:

    a. Wood screws on wood.

    b. Toggle bolts on hollow masonry.

    c. Bolts and expansion anchors in concrete or brick.

    d. Machine screws, threaded rods and clamps on steel.

    e. Conduit clips on steel joists.

    f. Plastic anchors are not allowed.

    g. Conduit hangers from drop rod (like Caddy B18 Series) are acceptable only upon prior written approval from the Owner.

H. Fittings shall be approved for grounding purposes or shall be jumpered with a copper grounding conductor of appropriate ampacity. Leave termination of such jumpers exposed. Conduit and wireway systems shall not serve as branch circuit grounding conductors.

I. Install underground conduits with sealing glands equal to OZ Type FSK exterior to the conduit and OZ type CSB, or equal internally at the point where conduits enter the building to prevent water seepage into the building.

J. nnnnnInstall expansion fittings in metal conduit as follows:

1. Conduit Crossing Building Expansion Joints:

    a. EMT all sizes.

    b. Rigid Galvanized Steel (RGS) all sizes.

2. Conduits entering environmental rooms and other locations subject to thermal expansion and as required by NEC.

3. Provide conduit expansion fitting with an integral bonding braid, as in Crouse-Hinds Type XC.

4. Expansion fittings are not required where offsets, expansion loops, or flexible conduit are placed in conduit runs.

K. Install conduit concealed in walls, partitions and above ceilings. Install exposed in overhead conduit (at structure) of mechanical rooms and in other similar rooms where ceilings are not provided.

L. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.

M. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.

N. Install pull wires in empty conduits. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Jetline 232 or equal by Greenlee. Leave at least 12 inches of slack at each end of pull wire.

O. Cap ends of spare conduits and extend into space above accessible ceiling a minimum of 18 inches. Label conduit as spare.

P. Do not daisy chain conduit installations in or on walls, provide a single conduit wall drop per device.

Q. Install conduits outside of building lines at a minimum depth of 30 inches below finished grade. Maintain twelve inches earth or two inches concrete separation between electrical conduits and other services or utilities underground. Encase all plastic service entrance conduits with concrete unless otherwise specifically detailed or noted on the drawings.

R. Ducts in concrete encased ductbanks shall be independently supported by interlocking module spacers by Formex or equal. Spacers shall provide 3 inches separation between adjacent ducts. Spacers shall be installed at 6 feet maximum intervals.

S. Ducts in concrete encased ductbanks shall be terminated in manholes, pull boxes, and vaults with interlocking terminators. A watertight tapered plug shall be furnished and installed in unused duct openings. Where terminators are installed in new work, they shall be poured-in-place.

3.03 INSTALLATION - WIREWAYS AND TERMINAL BOXES

A. Bolt wireways and terminal boxes to steel channels fastened to the wall or in self-supporting structure. Install level.

B. Gasket each joint in oil-tight wireway.

C. Mount rain-tight wireway in horizontal position only.

3.04 INSTALLATION - BOXES

A. Provide electrical boxes as shown on Drawings, and as required for wire pulling, equipment connection, and code compliance. Electrical box locations shown on Drawings are approximate unless dimensioned. Verify location of outlets prior to rough in. Locate and install boxes to allow access and clearances per NEC.

B. J-boxes shall be provided for branch circuits in excess of 100 feet.

C. Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps, and metal strap for supporting outlet boxes. Accessories shall be compatible with outlet boxes being used and shall meet requirements of individual situations.

D. Do not install boxes back-to-back in walls. Provide minimum 6-inch separation in non-fire-rated walls. Provide minimum 24-inch horizontal separation in acoustic-rated walls.

E. Membrane penetration of minimum 1-hour, up to maximum 2-hour fire rating walls and partitions by recessed steel electrical boxes that do not exceed 16 square inches in area are permitted, provided the aggregate area of the openings does not exceed 100 square inches in any 100 square feet of wall area. The annular space between the wall membrane and the box shall not exceed 1/8 inch. Such boxes on opposite sides of the wall or partition shall be either separated by a horizontal distance of not less than 24 inches or separated by protecting both boxes by listed putty pads or other listed materials and methods.

F. Secure boxes rigidly to the substrate upon which they are being mounted, or solidly imbed boxes in concrete or masonry. Boxes shall not be permitted to move laterally. Boxes shall be secured between two studs. Boxes connected to one stud are not permitted.

G. Provide knockout plugs for unused openings.

H. Use multiple-gang boxes where more than one device is mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.

I. Install boxes in walls without damaging wall insulation.

J. Outlet boxes in plaster partitions shall be “shallow-type” set flush in wall so there is at least 5/8-inch plaster covering back of box.

K. Switch boxes shall not be used as junction boxes.

L. Coordinate outlet heights with Architectural Drawings, millwork details, casework details and equipment installation. Where discrepancies occur, ask for an interpretation from the Architect/Engineer and Owner.

M. In inaccessible ceiling areas, position outlets and junction boxes within 6 inches of recessed luminaires, to be accessible through luminaire ceiling opening.

N. Outlet boxes supporting fixtures shall be securely anchored in place in an approved manner. Support outlet boxes and fixtures in acoustic ceiling areas from building structures with separate supports, not from acoustic ceiling or ceiling tile wire. Lighting fixture outlets shall be coordinated with mechanical and architectural equipment and elements to eliminate conflicts and to provide a workable neat installation.

O. Locate pull boxes and junction boxes above accessible ceilings or in unfinished areas.

P. Support pull and junction boxes independent of conduit. Combination box/conduit hangers from drop rod (like Caddy B18 Series) are acceptable only upon prior written approval from the Owner.

Q. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations. Set floor boxes level, and adjust floor box flush with finish flooring material.

3.05 INSTALLATION - SURFACE METAL RACEWAYS

A. All raceway systems shall be installed complete, including insulating bushings and inserts where required by manufacturer’s installation sheets. All unused raceway openings shall be closed.

B. Install raceways above ceilings, exposed, on walls and casework parallel to or at right angles to structure and casework. Securely support raceway at intervals not exceeding 10 feet or in accordance with manufacturer’s recommendations.

C. The number of conductors installed in any raceway shall not be greater than the number for which the raceway is approved.

D. Maintain grounding continuity between raceway components to provide a continuous grounding path by means of separate insulated code-size grounding conductors.

1. Each equipment grounding conductor in a conduit homerun entering the raceway shall be connected to the ground terminals of the receptacles.

END OF SECTION 26 05 33

SECTION 26 05 43

UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Conduit, ducts, and duct accessories for direct-buried and concrete-encased duct banks, and in single duct runs.
2. Handholes and boxes.
3. Manholes.

1.3 DEFINITION

A. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Duct-bank materials, including separators and miscellaneous components.
2. Ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
3. Accessories for manholes, handholes, boxes.
4. Warning tape.

B. Shop Drawings for Factory-Fabricated Handholes and Boxes Other Than Precast Concrete: Include dimensioned plans, sections, and elevations, and fabrication and installation details, including the following:

1. Duct entry provisions, including locations and duct sizes.
2. Cover design.
3. Grounding details.
4. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

C. Duct-Bank Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures.

1. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.

D. Product Certificates: For concrete and steel used in precast concrete manholes and handholes, as required by ASTM C 858.

E. Source quality-control test reports.

F. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Comply with ANSI C2.

C. Comply with NFPA 70.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver ducts to Project site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.

B. Store precast concrete and other factory-fabricated underground utility structures at Project site as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.

C. Lift and support precast concrete units only at designated lifting or supporting points.

1.7 COORDINATION

A. Coordinate layout and installation of ducts, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field.

B. Coordinate elevations of ducts and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of ducts and duct banks as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations from those indicated as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Architect.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Furnish cable-support stanchions, arms, insulators, and associated fasteners in quantities equal to 5 percent of quantity of each item installed.

PART 2 - PRODUCTS

2.1 CONDUIT

A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.

B. RNC: NEMA TC 2, Type EPC-40-PVC and Type EPC-80-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.2 NONMETALLIC DUCTS AND DUCT ACCESSORIES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ARNCO Corp.
2. Beck Manufacturing.
3. Cantex, Inc.
4. CertainTeed Corp.; Pipe & Plastics Group.
5. Condux International, Inc.
6. ElecSys, Inc.
7. Electri-Flex Company.
8. IPEX Inc.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT; a division of Cable Design Technologies.
11. Spiraduct/AFC Cable Systems, Inc.

B. Underground Plastic Utilities Duct: NEMA TC 6 & 8, Type EB-20-PVC, ASTM F 512, UL 651A, with matching fittings by the same manufacturer as the duct, complying with NEMA TC 9.

C. Duct Accessories:

1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and sizes of ducts with which used, and selected to provide minimum duct spacings indicated while supporting ducts during concreting or backfilling.
2. Warning Tape: Underground-line warning tape specified in Division 26 Section "Identification for Electrical Systems."
3. Concrete Warning Planks: Nominal 12 by 24 by 3 inches (300 by 600 by 76 mm) in size, manufactured from 6000-psi (41-MPa) concrete.

    a. Color: Red dye added to concrete during batching.
    b. Mark each plank with "ELECTRIC" in 2-inch- (50-mm-) high, 3/8-inch- (10-mm-) deep letters.

2.3 PRECAST CONCRETE HANDHOLES AND BOXES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Carder Concrete Products.
2. Christy Concrete Products.
3. Elmhurst-Chicago Stone Co.
4. Oldcastle Precast Group.
5. Riverton Concrete Products; a division of Cretex Companies, Inc.
6. Utility Concrete Products, LLC.
7. Utility Vault Co.
8. Wausau Tile, Inc.

B. Comply with ASTM C 858 for design and manufacturing processes.

C. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.

1. Frame and Cover: Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.

2. Frame and Cover: Weatherproof steel frame, with steel cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.

   a. Cover Hinges: Concealed, with hold-open ratchet assembly.
   b. Cover Handle: Recessed.

3. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
4. Cover Legend: Molded lettering, "ELECTRIC".
5. Configuration: Units shall be designed for flush burial and have open bottom, unless otherwise indicated.
6. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.

   a. Extension shall provide increased depth of 12 inches (300 mm.
   b. Slab: Same dimensions as bottom of enclosure, and arranged to provide closure.

7. Windows: Precast openings in walls, arranged to match dimensions and elevations of approaching ducts and duct banks plus an additional 12 inches (300 mm) vertically and horizontally to accommodate alignment variations.

   a. Windows shall be located no less than 6 inches (150 mm) from interior surfaces of walls, floors, or frames and covers of handholes, but close enough to corners to facilitate racking of cables on walls, or,
   b. Window opening shall have cast-in-place, welded wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct banks.
   c. Window openings shall be framed with at least two additional No. 4 steel reinforcing bars in concrete around each opening.

8. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.

   a. Type and size shall match fittings to duct or conduit to be terminated.
   b. Fittings shall align with elevations of approaching ducts and be located near interior corners of handholes to facilitate racking of cable.

9. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.4 HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Description: Comply with SCTE 77.

1. Color: Gray.
2. Configuration: Units shall be designed for flush burial and have open bottom, unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC”.
6. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
7. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long and larger shall have factory-installed inserts for cable racks and pulling-in irons.

B. Polymer Concrete Handholes and Boxes with Polymer Concrete Cover: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Armorcast Products Company.
    b. Carson Industries LLC.
    c. CDR Systems Corporation.
    d. NewBasis.

2.5 PRECAST MANHOLES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Carder Concrete Products.
2. Christy Concrete Products.
3. Elmhurst-Chicago Stone Co.
4. Oldcastle Precast Group.
5. Riverton Concrete Products; a division of Cretex Companies, Inc.
6. Utility Concrete Products, LLC.
7. Utility Vault Co.
8. Wausau Tile, Inc.

B. Comply with ASTM C 858, with structural design loading as specified in Part 3 "Underground Enclosure Application" Article and with interlocking mating sections, complete with accessories, hardware, and features.

1. Windows: Precast openings in walls, arranged to match dimensions and elevations of approaching ducts and duct banks plus an additional 12 inches (300 mm) vertically and horizontally to accommodate alignment variations.

    a. Windows shall be located no less than 6 inches (150 mm) from interior surfaces of walls, floors, or roofs of manholes, but close enough to corners to facilitate racking of cables on walls.
    b. Window opening shall have cast-in-place, welded wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct banks.
    c. Window openings shall be framed with at least two additional No. 4 steel reinforcing bars in concrete around each opening.

2. Duct Entrances in Manhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.

    a. Type and size shall match fittings to duct or conduit to be terminated.
    b. Fittings shall align with elevations of approaching ducts and be located near interior corners of manholes to facilitate racking of cable.

C. Concrete Knockout Panels: 1-1/2 to 2 inches (38 to 50 mm) thick, for future conduit entrance and sleeve for ground rod.

D. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.

2.6 CAST-IN-PLACE MANHOLES

A. Description: Underground utility structures, constructed in place, complete with accessories, hardware, and features. Include concrete knockout panels for conduit entrance and sleeve for ground rod.

B. Materials: Comply with ASTM C 858 and with Division 03 Section "Cast-in-Place Concrete."

C. Structural Design Loading: As specified in Part 3 "Underground Enclosure Application" Article.

2.7 UTILITY STRUCTURE ACCESSORIES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Bilco Company (The).
2. Campbell Foundry Company.
3. Carder Concrete Products.
4. Christy Concrete Products.
5. East Jordan Iron Works, Inc.
6. Elmhurst-Chicago Stone Co.
7. McKinley Iron Works, Inc.
8. Neenah Foundry Company.
9. NewBasis.
10. Oldcastle Precast Group.
11. Osburn Associates, Inc.
12. Pennsylvania Insert Corporation.
13. Riverton Concrete Products; a division of Cretex Companies, Inc..
14. Strongwell Corporation; Lenoir City Division.
15. Underground Devices, Inc.
16. Utility Concrete Products, LLC.
17. Utility Vault Co.
18. Wausau Tile, Inc.

B. Manhole Frames, Covers, and Chimney Components: Comply with structural design loading specified for manhole.

1. Frame and Cover: Weatherproof, complying with ASTM A 48/A 48M, Class 30B with milled cover-to-frame bearing surfaces; diameter, 26 inches (660 mm).

    a. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
    b. Special Covers: Recess in face of cover designed to accept finish material in paved areas.

2. Cover Legend: Cast in. Selected to suit system.

    a. Legend: "ELECTRIC-LV" for duct systems with power wires and cables for systems operating at 600 V and less.
    b. Legend: "ELECTRIC-HV" for duct systems with medium-voltage cables.
    c. Legend: "SIGNAL" for communications, data, and telephone duct systems.

3. Manhole Chimney Components: Precast concrete rings with dimensions matched to those of roof opening.

    a. Mortar for Chimney Ring and Frame and Cover Joints: Comply with ASTM C 270, Type M, except for quantities less than 2.0 cu. ft. (60 L) where packaged mix complying with ASTM C 387, Type M, may be used.

C. Manhole Sump Frame and Grate: ASTM A 48/A 48M, Class 30B, gray cast iron.

D. Pulling Eyes in Concrete Walls: Eyebolt with reinforcing-bar fastening insert, 2-inch- (50-mm) diameter eye, and 1-by-4-inch (25-by-100-mm) bolt.

1. Working Load Embedded in 6-Inch (150-mm), 4000-psi (27.6-MPa) Concrete: 13,000-lbf (58-kN) minimum tension.

E. Pulling-In and Lifting Irons in Concrete Floors: 7/8-inch- (22-mm-) diameter, hot-dip galvanized, bent steel rod; stress relieved after forming; and fastened to reinforcing rod. Exposed triangular opening.

1. Ultimate Yield Strength: 40,000-lbf (180-kN) shear and 60,000-lbf (270-kN) tension.

F. Bolting Inserts for Concrete Utility Structure Cable Racks and Other Attachments: Flared, threaded inserts of noncorrosive, chemical-resistant, nonconductive thermoplastic material; 1/2-inch (13-mm) ID by 2-3/4 inches (69 mm) deep, flared to 1-1/4 inches (32 mm) minimum at base.

1. Tested Ultimate Pullout Strength: 12,000 lbf (53 kN) minimum.

G. Expansion Anchors for Installation after Concrete Is Cast: Zinc-plated, carbon-steel-wedge type with stainless-steel expander clip with 1/2-inch (13-mm) bolt, 5300-lbf (24-kN) rated pullout strength, and minimum 6800-lbf (30-kN) rated shear strength.

H. Cable Rack Assembly: Steel, hot-dip galvanized, except insulators.

1. Stanchions: T-section or channel; 2-1/4-inch (57-mm) nominal size; punched with 14 holes on 1-1/2-inch (38-mm) centers for cable-arm attachment.
2. Arms: 1-1/2 inches (38 mm) wide, lengths ranging from 3 inches (75 mm) with 450-lb (204-kg) minimum capacity to 18 inches (460 mm) with 250-lb (114-kg) minimum capacity. Arms shall have slots along full length for cable ties and be arranged for secure mounting in horizontal position at any vertical location on stanchions.
3. Insulators: High-glaze, wet-process porcelain arranged for mounting on cable arms.

I. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F (2 deg C). Capable of withstanding temperature of 300 deg F (150 deg C) without slump and adhering to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.

J. Fixed Manhole Ladders: Arranged for attachment to wall and floor of manhole. Ladder and mounting brackets and braces shall be fabricated from nonconductive, structural-grade, fiberglass-reinforced resin.

K. Cover Hooks: Heavy duty, designed for lifts 60 lbf (270 N) and greater. Two required.

2.8 SOURCE QUALITY CONTROL

A. Test and inspect precast concrete utility structures according to ASTM C 1037.

B. Nonconcrete Handhole and Pull-Box Prototype Test: Test prototypes of manholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by a independent testing agency.

2. Strength tests of complete boxes and covers shall be by either an independent testing agency or the manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 UNDERGROUND DUCT APPLICATION

A. Ducts for Electrical Cables Over 600 V: RNC, NEMA Type EB-20-PVC, in concrete-encased duct bank, unless otherwise indicated.

B. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EB-20-PVC, in concrete-encased duct bank, unless otherwise indicated.

C. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank, unless otherwise indicated.

D. Ducts for Electrical Branch Circuits: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank, unless otherwise indicated.

E. Underground Ducts Crossing Paved Paths, Walks and Driveways/Roadways: RNC, NEMA Type EPC-40-PVC, encased in reinforced concrete.

3.2 UNDERGROUND ENCLOSURE APPLICATION

A. Handholes and Boxes for 600 V and Less:

1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete. AASHTO HB 17, H-20 structural load rating.
2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Fiberglass enclosures with polymer concrete frame and cover, SCTE 77, Tier 15 structural load rating.
3. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Polymer concrete units, SCTE 77, Tier 8 structural load rating.
4. Units Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf (13 345-N) vertical loading.

B. Manholes: Precast concrete.

1. Units Located in Roadways and Other Deliberate Traffic Paths by Heavy or Medium Vehicles: H-20 structural load rating according to AASHTO HB 17.
2. Units Not Located in Deliberate Traffic Paths by Heavy or Medium Vehicles: H-10 load rating according to AASHTO HB 17.

3.3 EARTHWORK

A. Excavation and Backfill: Comply with Division 31 Section "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.

B. Restore surface features at areas disturbed by excavation and reestablish original grades, unless otherwise indicated. Replace removed sod immediately after backfilling is completed.

C. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Division 32 Sections "Turf and Grasses" and "Plants."

D. Cut and patch existing pavement in the path of underground ducts and utility structures according to Division 01 Section "Cutting and Patching."

3.4 DUCT INSTALLATION

A. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes to drain in both directions.

B. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches (1220 mm), both horizontally and vertically, at other locations, unless otherwise indicated.

C. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.

D. Duct Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches (250 mm) o.c. for 5-inch (125-mm) ducts, and vary proportionately for other duct sizes.

1. Begin change from regular spacing to end-bell spacing 10 feet (3 m) from the end bell without reducing duct line slope and without forming a trap in the line.
2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to manhole or handhole.
3. Grout end bells into structure walls from both sides to provide watertight entrances.

E. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet (3 m) outside the building wall without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition. Install conduit penetrations of building walls as specified in Division 26 Section "Common Work Results for Electrical."

F. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig (1.03-MPa) hydrostatic pressure.

G. Pulling Cord: Install 100-lbf- (445-N-) test nylon cord in ducts, including spares.

H. Concrete-Encased Ducts: Support ducts on duct separators.

1. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than 4 spacers per 20 feet (6 m) of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 6 inches (150 mm) between tiers. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
2. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.

    a. Start at one end and finish at the other, allowing for expansion and contraction of ducts as their temperature changes during and after the pour. Use expansion

fittings installed according to manufacturer's written recommendations, or use other specific measures to prevent expansion-contraction damage.

b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch (19-mm) reinforcing rod dowels extending 18 inches (450 mm) into concrete on both sides of joint near corners of envelope.

3. Pouring Concrete: Spade concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Use a plank to direct concrete down sides of bank assembly to trench bottom. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.
4. Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
5. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
6. Minimum Space between Ducts: 3 inches (75 mm) between ducts and exterior envelope wall, 2 inches (50 mm) between ducts for like services, and 4 inches (100 mm) between power and signal ducts.
7. Depth: Install top of duct bank at least 24 inches (600 mm) below finished grade in areas not subject to deliberate traffic, and at least 30 inches (750 mm) below finished grade in deliberate traffic paths for vehicles, unless otherwise indicated.
8. Stub-Ups: Use manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Extend concrete encasement throughout the length of the elbow.
9. Stub-Ups: Use manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
    b. Stub-Ups to Equipment: For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of base. Install insulated grounding bushings on terminations at equipment.

10. Warning Tape: Bury warning tape approximately 12 inches (300 mm) above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches (75 mm) of the centerline of duct bank. Provide an additional warning tape for each 12-inch (300-mm) increment of duct-bank width over a nominal 18 inches (450 mm). Space additional tapes 12 inches (300 mm) apart, horizontally.

I. Direct-Buried Duct Banks:

1. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
2. Space separators close enough to prevent sagging and deforming of ducts, with not less than 4 spacers per 20 feet (6 m) of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches (150 mm) between tiers.
3. Excavate trench bottom to provide firm and uniform support for duct bank. Prepare trench bottoms as specified in Division 31 Section "Earth Moving" for pipes less than 6 inches (150 mm) in nominal diameter.
4. Install backfill as specified in Division 31 Section "Earth Moving."
5. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand-place backfill to 4 inches (100 mm) over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength.

Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving."

6. Install ducts with a minimum of 3 inches (75 mm) between ducts for like services and 6 inches (150 mm) between power and signal ducts.
7. Depth: Install top of duct bank at least 36 inches (900 mm) below finished grade, unless otherwise indicated.
8. Set elevation of bottom of duct bank below the frost line.
9. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
10. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
    b. For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

3.5 INSTALLATION OF CONCRETE MANHOLES, HANDHOLES, AND BOXES

A. Cast-in-Place Manhole Installation:

1. Finish interior surfaces with a smooth-troweled finish.
2. Windows for Future Duct Connections: Form and pour concrete knockout panels 1-1/2 to 2 inches (38 to 50 mm) thick, arranged as indicated.
3. Cast-in-place concrete, formwork, and reinforcement are specified in Division 03 Section "Cast-in-Place Concrete."

B. Precast Concrete Handhole and Manhole Installation:

1. Comply with ASTM C 891, unless otherwise indicated.
2. Install units level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances.
3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch (25-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevations:

1. Manhole Roof: Install with rooftop at least 15 inches (380 mm) below finished grade.
2. Manhole Frame: In paved areas and trafficways, set frames flush with finished grade. Set other manhole frames 1 inch (25 mm) above finished grade.
3. Install handholes with bottom below the frost line, below grade.
4. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.
5. Where indicated, cast handhole cover frame integrally with handhole structure.

D. Drainage: Install drains in bottom of manholes where indicated. Coordinate with drainage provisions indicated.

E. Manhole Access: Circular opening in manhole roof; sized to match cover size.

1. Manholes with Fixed Ladders: Offset access opening from manhole centerlines to align with ladder.

2. Install chimney, constructed of precast concrete collars and rings to support frame and cover and to connect cover with manhole roof opening. Provide moisture-tight masonry joints and waterproof grouting for cast-iron frame to chimney.

F. Waterproofing: Apply waterproofing to exterior surfaces of manholes and handholes after concrete has cured at least three days. Waterproofing materials and installation are specified in Division 07 Section "Elastomeric Sheet Waterproofing." After ducts have been connected and grouted, and before backfilling, waterproof joints and connections and touch up abrasions and scars. Waterproof exterior of manhole chimneys after mortar has cured at least three days.

G. Dampproofing: Apply dampproofing to exterior surfaces of manholes and handholes after concrete has cured at least three days. Dampproofing materials and installation are specified in Division 07 Section "Bituminous Dampproofing." After ducts have been connected and grouted, and before backfilling, dampproof joints and connections and touch up abrasions and scars. Dampproof exterior of manhole chimneys after mortar has cured at least three days.

H. Hardware: Install removable hardware, including pulling eyes, cable stanchions, and cable arms as required for installation and support of cables and conductors and as indicated.

I. Fixed Manhole Ladders: Arrange to provide for safe entry with maximum clearance from cables and other items in manholes.

J. Field-Installed Bolting Anchors in Manholes and Concrete Handholes: Do not drill deeper than 3-7/8 inches (98 mm) for manholes and 2 inches (50 mm) for handholes, for anchor bolts installed in the field. Use a minimum of two anchors for each cable stanchion.

K. Warning Sign: Install "Confined Space Hazard" warning sign on the inside surface of each manhole cover.

3.6 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by the manufacturer.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.7-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas and trafficways, set so cover surface will be flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.

D. Install handholes and boxes with bottom below the frost line, below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.

F. Field-cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

G. For enclosures subject to occasional, nondeliberate, heavy-vehicle loading, form and pour a concrete ring encircling, and in contact with, enclosure and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.

1. Concrete: 3000 psi (20 kPa), 28-day strength, complying with Division 03 Section "Cast-in-Place Concrete," with a troweled finish.
2. Dimensions: 10 inches wide by 12 inches deep (250 mm wide by 300 mm deep).

3.7 GROUNDING

A. Ground underground ducts and utility structures according to Division 26 Section "Grounding and Bonding for Electrical Systems."

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
2. Pull aluminum or wood test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Division 26 Section "Grounding and Bonding for Electrical Systems."

B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.9 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

B. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION

26 05 53 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Items for identification of electrical products installed under Divisions 26 and 28.

1.02 SUBMITTALS

A. Submit product data.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. W.H. Brady Co.

B. Carlton Industries, Inc.

C. Seton Nameplate Co.

2.02 MATERIALS

A. Nameplates: Provide engraved three-layer laminated plastic nameplates with white letters on a black background.

B. Wire and Cable Markers: Provide vinyl cloth markers with split sleeve or tubing type, except in manholes provide stainless steel with plastic ties.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Degrease and clean surfaces to receive nameplates.

B. Install nameplates parallel to equipment lines.

C. Embossed tape will not be acceptable.

3.02 WIRE AND CABLE LABELING

A. Provide wire markers on each conductor in splice boxes, pull boxes, and at first load connection on homerun. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on equipment manufacturer's shop drawings for control wiring.

B. Identify branch circuit or feeder number for power and lighting circuits on cover of pull and junction boxes with indelible marker.

3.03 EQUIPMENT LABELING

A. Provide nameplates to identify all electrical distribution and control equipment.

B. Engraved, Laminated Plastic Nameplates: 1/4-inch letters, equipment designation; 1/8-inch letters, source circuit number. Provide for:

1. Enclosed switches, starters, circuit breakers and contactors. Provide neatly typed label inside each motor starter enclosure door identifying motor served, nameplate horsepower, full load amperes, design letter, service factor, and voltage/phase rating. Provide phenolic nameplate on cover exterior to indicate motor served.

C. Identify junction boxes by circuit number with legible permanent ink marker.

END OF SECTION

SECTION 26 09 43

NETWORK LIGHTING CONTROLS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes a networked lighting control system comprised of the following components:

1. System Software Interfaces

a. Management Interface

b. Visualization Interface

c. Smartphone Programming Interface for Wired Devices

B. System Backbone and Integration Equipment

1. System Controller

C. Wired Networked Devices

1. Wall Stations

2. Graphic Wall Stations

3. Digital Key Switches

4. Auxiliary Input/Output Devices

5. Occupancy and Photocell Sensors

6. Wall Switch Sensors

7. Embedded Sensors

8. Power Packs and Secondary Packs

9. Networked Luminaires

10. Relay and Dimming Panel

11. Bluetooth® Low Energy Programming Device

12. Communication Bridge

D. The networked lighting control system shall meet all the characteristics and performance requirements specified herein.

E. The contractor shall provide, install and verify proper operation of all equipment necessary for proper operation of the system as specified herein and as shown on applicable drawings.

1.02 RELATED DOCUMENTS

A. Section 26 27 26 Wiring Devices

B. Section 26 51 00 Lighting Fixtures

1.03 SUBMITTALS

A. Submittal shall be provided including the following items.

1. Bill of Materials necessary to install the networked lighting control system.

2. Product Specification Sheets indicating general device descriptions, dimensions, electrical specifications, wiring details, and nomenclature.

3. Riser Diagrams showing device wiring connections of system backbone and typical per room/area type.

4. Information Technology (IT) connection information pertaining to interconnection with facility IT networking equipment and third-party systems.

5. Other Diagrams and Operational Descriptions – as needed to indicate system operation or interaction with other system(s).

6. Contractor Startup/Commissioning Worksheet (must be completed prior to factory start-up).

7. Service Specification Sheets indicating general service descriptions, including startup, training, post-startup support, and service contract terms.

8. Hardware and Software Operation Manuals.

1.04 APPROVALS

A. Prior approval from owner's representative is required for products or systems manufactured by companies not specified in the Network Lighting Controls section of this specification.

B. Any alternate product or system that has not received prior approval from the owner's representative at least 10 days prior to submission of a proposal package shall be rejected.

C. Alternate products or systems require submission of catalog datasheets, system overview documents and installation manuals to owner's representative.

D. For any alternate system that does not support any form of wireless communication to networked luminaires, networked control devices, networked sensors, or networked input devices, bidders shall provide a total installed cost including itemized labor costs for installing network wiring to luminaires, control devices, sensors, input devices and other required system peripherals.

1.05 QUALITY ASSURANCE

A. Product Qualifications

1. System electrical components shall be listed or recognized by a nationally recognized testing laboratory (e.g., UL, ETL, or CSA) and shall be labeled with required markings as applicable.

2. System shall be listed as qualified under DesignLights Consortium Networked Lighting Control System Specification V2.0.

3. System luminaires and controls are certified by manufacturer to have been designed, manufactured and tested for interoperability.

4. All components shall be subjected to 100% end of line testing prior to shipment to the project site to ensure proper device operation.

5. All components and the manufacturing facility where product is manufactured must be RoHS compliant.

B. Installation and Startup Qualifications

1. System startup shall be performed by qualified personnel approved or certified by the manufacturer.

C. Service and Support Requirements

1. Phone Support: Toll free technical support shall be available.

2. Remote Support: The bidder shall offer a remote support capability.

3. Onsite Support: The bidder shall offer onsite support that is billable at whole day rates.

4. Service Contract: The bidder shall offer a Service Contract that packages phone, remote, and onsite support calls for the project. Response times for each type of support call shall be indicated in the terms of the service contract included in the bid package.

1.06 PROJECT CONDITIONS

A. Only install indoor equipment after the following site conditions are maintained:

1. Ambient Temperature: 14 to 105 degrees F (-10 to 40 degrees C)

2. Relative Humidity: less than 90% non-condensing

B. Equipment shall not be subjected to dust, debris, moisture, or temperature and humidity conditions exceeding the requirements indicated above or as marked on the product, at any point prior to installation.

C. Only properly rated equipment and enclosures, installed per the manufacturer's instructions, may be subjected to dust and moisture following installation.

1.07 WARRANTY

A. The manufacturer shall provide a minimum five-year warranty on all hardware devices supplied and installed. Warranty coverage shall begin on the date of shipment.

B. The hardware warranty shall cover repair or replacement any defective products within the warranty period.

1.08 MAINTENANCE & SUSTAINABILITY

A. The manufacturer shall make available to the owner new parts, upgrades, and/or replacements available for a minimum of 5 years following installation.

PART 2 - EQUIPMENT

2.01 MANUFACTURERS

A. Acceptable Manufacturers

1. Acuity Brands Lighting, Inc

2. Douglas Controls

3. Leviton

4. Lutron

2.02 SYSTEM COMPLIANCE

A. System components shall comply with UL 916 and UL 924 standards where applicable.

B. System components shall comply with CFR Title 47, Part 15 standards where applicable.

C. System components shall comply with ISED Canada RSS-247 standards where applicable.

D. All equipment shall be installed and connected in compliance with NFPA 70.

2.03 SYSTEM PERFORMANCE REQUIREMENTS

A. System Architecture

1. System shall have an architecture that is based upon three main concepts: (1) networkable intelligent lighting control devices, (2) standalone lighting control zones using distributed intelligence, (3) optional system backbone for remote, time based and global operation.

2. Intelligent lighting control devices shall have individually addressable network communication capability and consist of one or more basic lighting control components: occupancy sensor, photocell sensor, relay, dimming output, contact closure input, analog 0-10V input, and manual wall station capable of indicating switching, dimming, and/or scene control. Combining one or more of these components into a single device enclosure shall be permissible so as to minimize overall device count of system.

3. System must be capable of interfacing directly with networked luminaires such that either low voltage network cabling or wireless RF communication is used to interconnect networked luminaires with control components such as sensors, switches and system backbone (see *Control Zone Characteristics* sections for each type of network connection, wired or wireless).

4. Networked luminaires and intelligent lighting control devices shall support individual (unique) configuration of device settings and properties, with such configuration residing within the networked luminaires and intelligent control devices.

5. Lighting control zones consisting of one or more networked luminaires and intelligent lighting control devices and shall be capable of providing automatic control from sensors (occupancy and/or photocell) and manual control from local wall stations without requiring connection to a higher-level system backbone; this capability is referred to as “distributed intelligence.”

    a. Lighting control zones (wired and wireless) of at least 128 devices per zone shall be supported.

6. Networked luminaires and intelligent lighting control devices shall have distributed intelligence programming stored in non-volatile memory, such that following any loss of power the lighting control zones shall operate according to their defined default settings and sequence of operations.

7. Lighting control zones shall be capable of being networked with a higher-level system backbone to provide time based control, remote control from inputs and/or systems external to the control zone, and remote configuration and monitoring through a software interface.

8. The system may include one or more system controllers that provide time-based control. The system controller also provides a means of connecting the lighting control system to a system software interface and building management systems via BACnet/IP or BACnet MS/TP protocol.

9. All system devices shall support firmware update, either remotely or from within the applications space, for purposes of upgrading functionality at a later date.

B. Wired Networked Control Zone Characteristics

1. Connections to devices within a wired networked lighting control zone and to backbone components shall be with a single type of low voltage network cable, which shall be compliant with CAT5e specifications or higher. To prevent wiring errors and provide cost savings, the use of mixed types of low voltage network cables shall not be permitted.

2. Devices in an area shall be connected via a “daisy-chain” topology; requiring all individual networked devices to be connected back to a central component in a “hub-and-spoke” topology shall not be permitted, so as to reduce the total amount of network cable required for each control zone.

3. System shall provide the option of having pre-terminated plenum rated low voltage network cabling supplied with hardware so as to reduce the opportunity for improper wiring and communication errors during system installation.

4. Following proper installation and provision of power, all networked devices connected together with low voltage network cable shall automatically form a functional lighting control zone without requiring any type of programming, regardless of the programming mechanism (e.g. software application, handheld remote, pushbutton). The “out of box” default sequence of operation is intended to provide typical sequence of operation so as to minimize the system startup and programming requirements and to also have functional lighting control operation prior to system startup and programming.

5. Once software is installed, system shall be able to automatically discover all connected devices without requiring any provisioning of system or zone addresses.

6. All networked devices shall have the ability to detect improper communication wiring and blink its LED in a specific cadence as to alert installation/startup personnel.

7. Networked control devices intended for control of egress and/or emergency light sources shall not require the use of additional, externally mounted UL924 shunting and/or 0-10V disconnect devices, so as to provide a compliant sequence of operation while reducing the overall installation and wiring costs of the system. The following types of wired networked control devices shall be provided for egress and/or emergency light fixtures:

a. Low-Voltage power sensing: These devices shall automatically provide 100% light level upon detection of loss of power sensed via the low voltage network cable connection.

b. UL924 Listed Line-Voltage power sensing: These devices shall be listed as emergency relays under the UL924 standard, and shall automatically close the load control relay and provide 100% light output upon detection of loss of power sensed via line voltage connection to normal power.

8. Networked luminaires and intelligent lighting control devices located in different areas shall be able to transmit and track information within at least 128 system-wide control zones to support required sequences of operation that may span across multiple areas. Occupancy and photocell commands shall be available across a single controller, and switch commands shall be available across single or multiple controllers. These shall also be referred to as global control zones.

9. Wired networked Wall stations shall provide the follow Scene Control Capabilities:

a. Preset Scenes that can activate a specific combination of light levels across multiple local and global channels, as required.

b. Profile Scenes that can modify the sequence of operation for the devices in the area (group) in response to a button press. This capability is defined as supporting “Local Profiles” and is used to dynamically optimize the occupant experience and lighting energy usage. Wall stations shall be able to manually start and stop Local Profiles, or the local profile shall be capable of ending after a specific duration of time between 5 minutes and 12 hours. Parameters that shall be configurable and assigned to a Local Profile shall include, but not be limited to, fixture light level, occupancy time delay, response to occupancy sensors (including enabling/disabling response), response to daylight sensors (including enabling/disabling response), and enabling/disabling of wall stations.

c. 3-way / multi-way control: multiple wall stations shall be capable of controlling the same local and global control zones, so as to support “multi-way” preset scene and profile scene control.

C. System Integration Capabilities

1. The system shall interface with third party building management systems (BMS) to support two-way communication using the industry standard BACnet/IP or BACnet MS/TP protocols. The following system integration capabilities shall be available via BACnet/IP and BACnet MS/TP protocols:

a. The system shall support control of individual devices, including, but not limited to, control of relay and dimming output.

b. The system shall support reading of individual device status information. The available status will depend on the individual device type and capabilities, which may include but not be limited to, relay state, dimming output, power measurement, occupancy sensor status, and photocell sensor states or readings. All system devices shall be available for polling for devices status.

c. The system shall support activation of pre-defined system Global Profiles (see Supported Sequence of Operations for further definition of Global Profile capabilities).

2. The system shall support activation of Global Profiles from third party systems by receiving dry contact closure output signals or digital commands via RS-232/RS-485. (See *Supported Sequence of Operations for further definition of Profile and Scene Preset capabilities.)*

3. The system shall support activation of demand response levels from Demand Response Automation Servers (DRAS) via the OpenADR 2.0a protocol.

D. Supported Sequence of Operations

1. Control Zones

a. Networked luminaires and intelligent lighting control devices installed in an area (also referred to as a group of devices) shall be capable of transmitting and tracking occupancy sensor, photocell sensor, and manual switch information within at least 48 unique control zones to support different and reconfigurable sequences of operation within the area. These shall also be referred to as local control zones.

2. Wall station Capabilities

a. Wall stations shall be provided to support the following capabilities:

b. On/Off of a local control zone.

c. Continuous dimming control of light level of a local control zone.

d. 3-way / multi-way control: multiple wall stations shall be capable of controlling the same local control zones, so as to support “multi-way” switching and/or dimming control.

3. Occupancy Sensing Capabilities

a. Occupancy sensors shall be configurable to control a local zone.

b. Multiple occupancy sensors shall be capable of controlling the same local zones. This capability combines occupancy sensing coverage from multiple sensors without consuming multiple control zones.

c. System shall support the following types of occupancy sensing sequence of operations:

d. On/Off Occupancy Sensing

e. Partial-On Occupancy Sensing

f. Partial-Off Occupancy Sensing

g. Vacancy Sensing (Manual-On / Automatic-Off)

h. On/Off, Partial-On, and Partial-Off Occupancy Sensing modes shall function according to the following sequence of operation:

i. Occupancy sensors shall automatically turn lights on to a designated level when occupancy is detected. To support fine tuning of Partial-On sequences the designated occupied light level shall support at least 100 dimming levels.

j. Occupancy sensors shall automatically turn lights off or to a dimmed state (Partial-Off) when vacancy occurs or if sufficient daylight is detected. To support fine tuning of Partial-Off sequences the designated unoccupied dim level shall support at least 100 dimming levels.

k. To provide additional energy savings the system shall also be capable of combining Partial-Off and Full-Off operation by dimming the lights to a designated level when vacant and then turning the lights off completely after an additional amount of time.

l. Photocell readings, if enabled in the Occupancy Sensing control zone, shall be capable of automatically adjusting the light level during occupied or unoccupied conditions as necessary to further reduce energy usage. Additional requirements and details for photocell sensing capabilities are indicated under Photocell Sensing Capabilities.

m. The use of a wall station shall change the dimming level or turn lights off as selected by the occupant. The lights shall optionally remain in this manually-specified light level until the zone becomes vacant; upon vacancy the normal sequence of operation, as defined above, shall proceed.

n. Vacancy Sensing mode (also referred to as Manual-On / Automatic-Off) shall function according to the following sequence of operation:

o. The use of a wall station is required turn lights on. The system shall be capable of programming the zone to turn on to either to a designated light level or the previous user light level. Initially occupying the space without using a wall station shall not result in lights turning on.

p. Occupancy sensors shall automatically turn lights off or to a dimmed state (Partial-Off) when vacancy occurs or if sufficient daylight is detected. To support fine tuning of Partial-Off sequences the designated unoccupied dim level shall support at least 100 dimming levels.

q. To provide additional energy savings and an enhanced occupant experience, the system shall also be capable of dimming the lights when vacant and then turning the lights off completely after an additional amount of time.

r. To minimize occupant impact in case the area or zone is still physically occupied following dimming or shutoff of the lights due to detection of vacancy, the system shall support an “automatic grace period” immediately following detection of vacancy, during which time any detected occupancy shall result in the lights reverting to the previous level. After the grace period has expired, the use of a wall station is required to turn lights on.

s. Photocell readings, if enabled in the Occupancy Sensing control zone, shall be capable of automatically adjusting the light level during occupied or unoccupied conditions as necessary to further reduce energy usage. Additional requirements and details for photocell sensing capabilities are indicated under Photocell Sensing Capabilities.

t. At any time, the use of a wall station shall change the dimming level or turn lights off as selected by the occupant. The lights shall optionally remain in this manually-specified light level until the zone becomes vacant; upon vacancy the normal sequence of operation, as defined above, shall proceed.

u. To accommodate diverse types of environments, occupancy time delays before dimming or shutting off lights shall be specifiable for control zones between 15 seconds to 2 hours.

4. Photocell Sensing Capabilities (Automatic Daylight Sensing)

a. Photocell sensing devices shall be configurable to control a local zone.

b. The system shall support the following type of photocell-based control:

c. Continuous Dimming: The control zone automatically adjusts its dimming output in response to photocell readings, such that a minimum light level consisting of both electric light and daylight sources is maintained at the task. The photocell response shall be configurable to adjust the photocell setpoint and dimming rates.

5. Schedule Capabilities

a. System shall support the creation of time schedules for time-of-day override of devices including offsets from dusk and dawn.

b. System shall support blink warning and timed extension capabilities. At the end of a scheduled period, the system shall be capable of providing a visible “blink warning” 5 minutes prior to the end of the schedule. Wall stations may be programmed to provide timed overrides that turn the lights on for an additional period of time. Timed override duration shall be programmable for each individual device, zone of devices, or customized group of devices, ranging from 5 minutes to 12 hours.

6. Global Profile Capabilities

a. The system shall be capable of automatically modifying the sequence of operation for selected devices in response to any of the following: a time-of-day schedule, contact closure input state, manually triggered wired wall station input, RS-232/RS-485 command to wired input device, and BACnet input command. This capability is defined as supporting “Global Profiles” and is used to dynamically optimize the occupant experience and lighting energy usage.

b. Global profiles may be scheduled with the following capabilities:

c. Global Profiles shall be stored within and executed from the system controller (via internal timeclock) such that a dedicated software host or server is not required to be online to support automatic scheduling and/or operation of Global Profiles.

d. Global Profile time-of-day schedules shall be capable of being given the following recurrence settings: daily, specific days of week, every “n” number of days, weekly, monthly, and yearly. Lighting control profile schedules shall support definition of start date, end date, end after “n” recurrences, or never ending. Daylight savings time adjustments shall be capable of being performed automatically, if desired.

e. Global Profile Holiday Schedules should follow recurrent settings for specific US holiday dates regardless if they always occur on a specific date or are determined by the day/week of the month.

f. Global Profiles shall be capable of being scheduled to run according to timed offsets relative to sunrise or sunset. Sunrise/sunset times shall be automatically derived from location information using an astronomical clock.

g. Software management interface shall be capable of displaying a graphic calendar view of profile schedules for each control zone.

h. System Global Profiles shall have the following additional capabilities:

i. Global Profiles shall be capable of being manually activated directly from the system controller, specially programmed wired input devices, scene capable wired wall stations, and the software management interface.

j. Global Profiles shall be selectable to apply to a single device, zone of devices, or customized group of devices.

k. Parameters that shall be configurable and assigned to a Global Profile shall include, but not be limited to, fixture light level, occupancy time delay, response to occupancy sensors (including enabling/disabling response), response to daylight sensors (including enabling/disabling response), and enabling/disabling of wall stations.

l. A backup of Local and Global Profiles shall be stored on the software's host server such that the Profile backup can be applied to a replacement system controller or wired wall station.

7. System shall support automated demand response capabilities with automatic reduction of light level to at least three levels of demand response.

2.04 SYSTEM SOFTWARE INTERFACES

1. Management Interface

2. System shall provide a web-based management interface that provides remote system control, live status monitoring, and configuration capabilities of lighting control settings and schedules.

3. Management interface must be compatible with industry-standard web browser clients, including, but not limited to, Microsoft Internet Explorer®, Apple Safari®, Google Chrome®, Mozilla Firefox®.

4. Management interface shall require all users to login with a User Name and Password, and shall support creation of at least 100 unique user accounts.

5. Management interface shall support at least three permission levels for users: read-only, read & change settings, and full administrative system access.

6. Management interface shall be capable of restricting access for user accounts to specific devices within the system.

7. All system devices shall be capable of being given user-defined names.

8. The following device identification information shall be displayed in the Management interface: model number, model description, serial number or network ID, manufacturing date code, custom label(s), and parent network device.

9. Management interface shall be able to read the live status of a networked luminaire or intelligent control device and shall be capable of displaying luminaire on/off status, dim level, power measurement, device temperature, PIR occupancy sensor status, microphonic occupancy sensor status, remaining occupancy time delay, photocell reading, and active Profiles.

10. Management interface shall be able to read the current active settings of a networked luminaire or intelligent control device and shall be capable of displaying dimming trim levels, occupancy sensor and photocell enable/disable, occupancy sensor time delay and light level settings, occupancy sensor response (normal or vacancy), and photocell setpoints and transition time delays.

11. Management interface shall be able to change the current active settings and default settings for an individual networked luminaire or intelligent control device.

12. Management interface shall be capable of applying settings changes for a zone of devices or a group of selected devices using a single “save” action that does not require the user to save settings changes for each individual device.

13. A printable network inventory report shall be available via the management interface.

14. A printable report detailing all system profiles shall be available via the management interface.

15. All sensitive information stored by the software shall be encrypted.

16. All system software updates must be available for automatic download and installation via the internet.

17. Visualization and Programming Interfaces

18. System shall provide an optional web-based visualization interface that displays graphical floorplan.

19. Graphical floorplan shall offer the following types of system visualization:

20. Full Device Option - A master graphic of the entire building, by floor, showing each control device installed in the project with zones outlined. This shall include, but not be limited to, the following:

21. Controls embedded light fixtures

22. Controls devices not embedded in light fixtures

23. Daylight Sensors

24. Occupancy Sensors

25. Wall Switches and Dimmers

26. Scene Controllers

27. Networked Relays

28. Wired Bridges

29. System Controllers

30. Wired Relay Panels

31. Group outlines

32. Group Only Option - A master graphic of the entire building, by floor, showing only control groups outlined.

33. Allow for pan and zoom commands so smaller areas can be displayed on a larger scale simply by panning and zooming each floor’s master graphic.

34. A mouse click on any control device shall display the following information (as applicable):

35. The device catalog number.

36. The device name and custom label.

37. Device diagnostic information.

38. Information about the device status or current configuration is available with an additional mouse click.

39. Application interface shall be provided for both Apple iOS® and Android operating systems that allows configuration of lighting control settings.

40. The application shall support the configuration and control of wired networked control devices via a Bluetooth® Low Energy (BLE) Programming Device.

41. Application shall support a security pin-code to access the zone of lighting control devices.

42. The application shall provide indication of signal strength where multiple Bluetooth Low Energy Programming Devices are available for configuration.

43. The application shall indicate the number of wired networked control devices connected to the local daisy-chain zone.

44. The application shall provide on/off/dimming control of all control groups.

45. The application shall provide the ability to identify all individual luminaires and control devices.

46. Programming capabilities through the application shall include, but not be limited to, the following:

47. Switch/occupancy/photosensor zone configuration

48. Manual/automatic on modes

49. Turn-on dim level

50. Occupancy sensor time delays

51. Dual technology occupancy sensors sensitivity

52. Photosensor calibration adjustment and auto-setpoint

53. Multiple photosensor zone offset

54. Trim level settings

55. Preset scene creation and copy for scene capable devices.

56. Application of custom device labels to the Bluetooth Low Energy Programming Devices and individual connected lighting control devices.

2.05 SYSTEM BACKBONE AND SYSTEM INTEGRATION EQUIPMENT

1. System Controller

2. System Controller shall be multi-tasking, real-time digital control processor consisting of modular hardware with plug-in enclosed processors, communication controllers, and power supplies.

3. System Controller shall have 32-bit microprocessor operating at a minimum of 1 GHz.

4. {nLSbie}System Controller shall have minimum of 512MB memory, with a minimum of 4GB non-volatile flash, to support its own operating system and databases.

5. System Controller shall perform the following functions:

6. Time-based control of downstream wired and wireless network devices.

7. Linking into an Ethernet network.

8. Integration with Building Management Systems (BMS) and Heating, Ventilation and Air Conditioning (HVAC) equipment.

9. Connection to various software interfaces, including management interface, historical database and analytics interface, and visualization interface.

10. System Controller shall have an integral web server to support configuration, diagnostics and hosting of software interfaces.

11. Device shall have option for a graphical touch screen to support configuration and diagnostics.

12. Device shall have three RJ-45 networked lighting control ports for connection to any of the following:

13. The graphical touch screen

14. Wired communication bridges

15. Direct connection to networked wired luminaires and intelligent lighting control devices (up to 128 total devices per port)

16. Device shall automatically detect all networked devices connected to it.

17. Device shall have an internal time clock used for astronomical and standard schedules.

18. Device shall have 2 switched RJ-45 10/100 BaseT Ethernet ports for local area network (LAN) connection.

19. Ethernet connection shall support daisy chain wiring to other lighting control system LAN devices.

20. Ethernet connection shall support IPv4 and shall be capable of using a dedicated static or DHCP assigned IP address.

21. Device shall have 2 x USB 2.0 Expansion ports for 802.11 Wi-Fi Adapter enabling wireless connectivity including:

22. Hot Spot

23. Access Point

24. Client

25. Each System Controller shall be capable of managing and operating at least 750 networked devices (wired or wireless).

26. Multiple System Controllers may be networked together via LAN connection to scale the system up to 20,000 networked devices.

27. System Controller shall support BACnet/IP and BACnet MS/TP protocols to directly interface with BMS and HVAC equipment without the need for additional protocol translation gateways.

28. BACnet MS/TP shall support 9600 to 115200 baud rate.

29. System Controller shall be BACnet Testing Laboratory (BTL listed) using Device Profile BACnet Building Controller (B-BC) with outlined enhanced features.

30. System controller shall contain a “FIPS 140-2 Level 1 Inside” cryptographic module.

31. System controller shall support RESTful API control of BACnet objects, user management, date and time, and file management.

32. System controller shall be available within a NEMA 1 enclosure with Class 1 and Class 2 separation

33. Enclosure shall support power input power of 120-277VAC, or optional 347

2.06 WIRED NETWORKED DEVICES

A. Wired Networked Wall Switches, Dimmers, Scene Controllers

1. Devices shall recess into single-gang switch box and fit a standard GFI opening.

2. Communication and low voltage power shall be delivered to each device via standard low voltage network cabling with RJ-45 connectors.

3. All switches shall have the ability to detect when it is not receiving valid communication and blink its LED in a pattern to visually indicate a potential wiring issue.

4. Devices with mechanical push-buttons shall provide tactile and LED user feedback.

5. Devices with mechanical push-buttons shall be made available with custom button labeling.

6. Wall switches & dimmers shall support the following device options:

a. Number of control zones: 1, 2 or 4

b. Control Types Supported:

c. On/Off

d. On/Off/Dimming

e. On/Off/Dimming/Correlated Color Temperature Control for specific luminaire types

f. Colors: Per Architect and Interior Designer

7. Scene controllers shall support the following device options:

a. Number of scenes: 1, 2 or 4

b. Control Types Supported:

c. On/Off

d. On/Off/Dimming

e. Preset Level Scene Type

f. On/Off/Dimming/Preset Level for Correlated Color Temperature

g. Reprogramming of other devices within daisy-chained zone so as to implement user selected lighting scene. This shall support manual start/stop from the scene controller, or optionally programmed to automatically end after a user selectable duration between 5 minutes and 12 hours.

h. Selecting a lighting profile to be run by the system's upstream controller so as to implement a selected lighting profile across multiple zones. This shall support manual start/stop from the scene controller, or optionally programmed to automatically end after a user selectable duration between 5 minutes and 12 hours.

i. Colors: Per Architect and Interior Designer

B. Wired Networked Graphic Wall Stations

1. Device shall surface mount to single-gang switch box.

2. Device shall have a 3.5", capacitive full color touch screen.

3. Device shall be powered with Class 2 low voltage supplied locally via a directly wired power supply.

4. Device shall have a micro-USB style connector for local computer connectivity.

5. Device shall enable mobile application control of control zones and scenes.

6. Communication shall be over standard low voltage network cabling with RJ-45 connectors.

7. Device shall enable user supplied screen saver image to be uploaded within one of the following formats: jpg, png, gif, bmp, tif.

8. Device shall enable configuration of all switches, dimmers, control zones, and lighting preset scenes via password protected setup screens.

9. Graphic wall stations shall support the following device options:

a. Number of control zones: Up to 16

b. Number of scenes: Up to 16

c. Profile type scene duration: User configurable from 5 minutes to 12 hours

d. Colors: Per Architect and Interior Designer

C. Wired Networked Digital Key Switches

1. Devices shall recess into single-gang switch box and fit a standard GFI opening.

2. Communication and low voltage power shall be delivered to each device via standard low voltage network cabling with RJ-45 connectors.

3. All switches shall have the ability to detect when it is not receiving valid communication and blink its LED in a pattern to visually indicate a potential wiring issue.

4. Devices shall have LED user feedback to provide indication of on/off status of the programmed lights or scene, as well as indication of device power.

5. Digital key switches shall support the following device options:

    a. Control Types Supported:

    b. On/Off

    c. On/Off/Dimming

    d. Preset Level Scene Type

    e. Reprogramming of other devices within daisy-chained zone so as to implement user selected lighting scene. This shall support manual start/stop from the scene controller, or optionally programmed to automatically end after a user selectable duration between 5 minutes and 12 hours.

    f. Selecting a lighting profile to be run by the system's upstream controller so as to implement a selected lighting profile across multiple zones. This shall support manual start/stop from the scene controller, or optionally programmed to automatically end after a user selectable duration between 5 minutes and 12 hours.

    g. Colors: Per Architect and Interior Designer

D. Wired Networked Auxiliary Input / Output (I/O) Devices

1. Devices shall be plenum rated and be inline wired, screw mountable, or have an extended chase nipple for mounting to a ½" knockout.

2. Communication and low voltage power shall be delivered to each device via standard low voltage network cabling with RJ-45 connectors.

3. Auxiliary Input/Output Devices shall be specified as an input or output device with the following options:

    a. Contact closure or Pull High input

    b. Input shall be programmable to support maintained or momentary inputs that can activate local or global scenes and profiles, activate lights at a preconfigured level, ramp light level up or down, or toggle lights on/off.

    c. 0-10V analog input

    d. Input shall be programmable to function as a daylight sensor.

    e. RS-232/RS-485 digital input

f. Input supports activation of up to 4 local or global scenes and profiles, and on/off/dimming control of up to 16 local control zones.

g. 0-10V dimming control output, capable of sinking up to 20mA of current

h. Output shall be programmable to support all standard sequence of operations supported by system.

i. Digital control output via EldoLED LEDcode communication

j. Output shall be programmable to support light intensity control, as well as optional correlated color temperature (CCT) control, of the connected luminaire.

E. Wired Networked Occupancy and Photosensors

1. Occupancy sensors shall sense the presence of human activity within the desired space and fully control the on/off function of the lights.

2. Sensors shall utilize passive infrared (PIR) technology, which detects occupant motion, to initially turn lights on from an off state, thus preventing false on conditions. Ultrasonic or Microwave based sensing technologies shall not be accepted.

3. For applications where a second method of sensing is necessary to adequately detect maintained occupancy (such as in rooms with obstructions), a sensor with an additional “dual” technology shall be used.

4. Dual technology sensors shall have one of its two technologies not require motion to detect occupancy. Acceptable dual technology includes PIR/Microphonics (also known as Passive Dual Technology or PDT) which both looks for occupant motion and listens for sounds indicating occupants. Sensors where both technologies detect motion (PIR/Ultrasonic) shall not be acceptable.

5. All sensing technologies shall be acoustically passive, meaning they do not transmit sounds waves of any frequency (for example in the Ultrasonic range), as these technologies have the potential for interference with other electronic devices within the space (such as electronic white board readers). Acceptable detection technologies include Passive Infrared (PIR), and/or Microphonics technology. Ultrasonic or Microwave based sensing technologies shall not be accepted.

6. System shall have ceiling, fixture, recessed & corner mounted sensors available, with multiple lens options available customized for specific applications.

7. Communication and low voltage power shall be delivered to each device via standard low voltage network cabling with RJ-45 connectors.

8. All sensors shall have the ability to detect when it is not receiving valid communication and blink its LED in a pattern to visually indicate a potential wiring issue.

9. Sensor programming parameter shall be available and configurable remotely from the software and locally via the device push-button.

10. Ceiling mount occupancy sensors shall be available with zero or one integrated dry contact switching relays, capable of switching 1 amp at 24 VAC/VDC (resistive only).

11. Sensors shall be available with one or two occupancy “poles”, each of which provides a programmable time delay.

12. Sensors shall have optional features for photosensor/daylight override, automatic dimming control, and low temperature/high humidity operation.

13. Photosensor shall provide for an on/off set-point, and a dead band to prevent the artificial light from cycling. Delay shall be incorporated into the photocell to prevent rapid response to passing clouds.

14. Photosensor and dimming sensor's set-point and dead band shall be automatically calibrated through the sensor's microprocessor by initiating an "Automatic Set-point Programming" procedure. Min and max dim settings as well as set-point may be manually entered.

15. Dead band setting shall be verified and modified by the sensor automatically every time the lights cycle to accommodate physical changes in the space (i.e., furniture layouts, lamp depreciation, or lamp outages).

16. A dual zone option shall be available for On/Off Photocell, Automatic Dimming Control Photocell, or Combination units. The secondary daylight zone shall be capable of being controlled as an "offset" from the primary zone.

F. Wired Networked Wall Switch Sensors

1. Devices shall recess into single-gang switch box and fit a standard GFI opening.

2. Communication and low voltage power shall be delivered to each device via standard low voltage network cabling with RJ-45 connectors.

3. All wall switch sensors shall have the ability to detect when it is not receiving valid communication and blink its LED in a pattern to visually indicate a potential wiring issue.

4. Devices with mechanical push-buttons shall provide tactile user feedback.

5. Wall switches sensors shall support the following device options:

a. User Input Control Types Supported: On/Off or On/Off/Dimming

b. Occupancy Sensing Technology: PIR only or Dual Tech acoustic

c. Daylight Sensing Option: Inhibit Photosensor

d. Colors: Per Architect and Interior Designer

G. Wired Networked Embedded Sensors

1. Network system shall have embedded sensors consisting of occupancy sensors and/or dimming photocells that can be embedded into luminaire such that only the lens shows on luminaire face.

2. Occupancy sensor detection pattern shall be suitable for 7.5' to 20' mounting heights.

3. Embedded sensors shall support the following device options:

a. Occupancy Sensing technology: PIR only or Dual Tech acoustic

b. Daylight Sensing Option: Occupancy only, Daylight only, or combination Occupancy/Daylight sensor

H. Wired Networked Power Packs and Secondary Packs

1. Power Packs shall incorporate one optional Class 1 relay, optional 0-10 VDC dimming output, and contribute low voltage Class 2 power to the rest of the system.

2. Power Packs shall accept 120 or 277 VAC (or optionally 347 VAC) and carry a plenum rating.

3. Secondary Packs shall incorporate the relay and 0-10 VDC or line voltage dimming output, but shall not be required to contribute system power.

4. Power Supplies shall provide system power only, but are not required to switch line voltage circuit.

5. Auxiliary Relay Packs shall switch low voltage circuits only, capable of switching 1 amp at 40 VAC/VDC (resistive only).

6. Communication shall be delivered to each device via standard low voltage network cabling with RJ-45 connectors. Secondary packs shall receive low voltage power via standard low voltage network cable.

7. Power Pack programming parameters shall be available and configurable remotely from the software and locally via the device push-button.

8. Power Pack shall securely mount through a threaded ½ inch chase nipple or be capable of being secured within a luminaire ballast/driver channel. Plastic clips into junction box shall not be accepted. All Class 1 wiring shall pass through chase nipple into adjacent junction box without any exposure of wire leads. Note: UL Listing under Energy Management or Industrial Control Equipment automatically meets this requirement, whereas Appliance Control Listing does not meet this safety requirement.

9. When required by local code, Power Pack must install inside standard electrical enclosure and provide UL recognized support to junction box. All Class 1 wiring is to pass through chase nipple into adjacent junction box without any exposure of wire leads.

10. Power/Secondary Packs shall be available with the following options:

    a. Power Pack capable of full 16-Amp switching of all normal power lighting load types, with optional 0-10V dimming output capable of up to 100mA of sink current.

    b. Secondary Pack with UL924 listing for switching of full 16-Amp Emergency Power circuits, with optional 0-10V dimming output capable of up to 100mA of sink current.

    c. Power and Secondary Packs capable of full 20-Amp switching of general purpose receptacle (plug-load) control.

    d. Secondary Pack capable of full 16-Amp switching of all normal power lighting load types.

    e. Secondary Pack capable of 5-Amps switching and dimming 120 VAC incandescent lighting loads or 120/277 VAC line voltage dimmable fluorescent ballasts (2-wire and 3-wire versions).

    f. Secondary Pack capable of 5-Amps switching and dimming of 120/277 VAC magnetic low voltage transformers.

g. Secondary Pack capable of 4-Amps switching and dimming of 120 VAC electronic low voltage transformers.

h. Secondary Pack capable of louver/damper motor control for skylights.

i. Secondary Pack capable of providing a pulse on/pulse off signal for purposes of controlling shade systems via relay inputs.

j. Secondary Pack capable of switching 1 amp at 40 VAC/VDC (resistive only) with the intent to provide relay signal to auxiliary system (e.g. BMS).

11. Power Supply capable of providing auxiliary bus power (no switched or dimmed load).

I. Wired Networked Luminaires

1. Networked luminaire shall have a mechanically integrated control device.

2. Networked LED luminaire shall have two RJ-45 ports available (via control device directly or incorporated RJ-45 splitter).

3. Networked LED luminaire shall be able to digitally network directly to other network control devices (sensors, photocells, switches, dimmers).

4. Networked LED luminaire shall provide low voltage power to other networked control devices (excluding EMG and CCT capable versions).

5. System shall be able to turn on/off specific LED luminaires without using a relay, if LED driver supports “sleep mode.”

6. System shall be able to maintain constant lumen output over the specified life of the LED luminaire (also called lumen compensation) by automatically varying the dimming control signal to account for lumen depreciation.

a. System shall indicate (via a blink warning) when the LED luminaire is no longer able to compensate for lumen depreciation.

7. System shall be able to provide control of network luminaire intensity, in addition to correlated color temperature of specific LED luminaires.

8. System shall be able to provide control of network luminaire intensity, in addition to dynamic features, such as grayscale and color accent of specific LED luminaires.

J. Wired Networked Relay and Dimming Panel

1. Relay and dimming panel shall be available with 4, 8, 12, 16, 24, 32, 40 or 48 individual relays per panel, with an equal number of individual 0-10V dimming outputs.

2. Optional Field Configurable Relays (FCR) used shall have the following required properties:

a. Configurable in the field to operate with single-, double-, or triple-pole relay groupings.

b. Configurable in the field to operate with normally closed or normally open behavior.

c. Provides visual status of current state and manual override control of each relay.

d. Listed for the following minimum ratings:

e. 40A @ 120-480VAC Ballast

f. 16A @ 120-277VAC Electronic

g. 20A @ 120-277VAC Tungsten

h. 20A @ 48VDC Resistive

i. 2HP @ 120VAC

j. 3HP @ 240-277VAC

k. 65kA SCCR @ 480VAC

3. 0-10 dimming outputs shall support a minimum of 100mA sink current per output.

4. Relay and dimming outputs shall be individually programmable to support all standard sequence of operations as defined in this specification.

5. Panel shall be UL924 listed for control of emergency lighting circuits.

6. Panel shall power itself from an integrated 120-277 VAC or optional 347VAC supply.

7. Panel shall provide a configurable low-voltage sensor input with the following properties:

   a. Configurable to support any of the following input types:

   b. Indoor Photocell

   c. Outdoor Photocell

   d. Occupancy Sensor

   e. Contact Closure

   f. Low voltage sensor input shall provide +24VDC power for the sensor so that additional auxiliary power supplies are not required.

   g. Sensor input supports all standard sequence of operations as defined in this specification.

8. Panel shall provide a contact closure input for each group of 8-relays that acts as a panel override to activate the normally configured state of all relays (i.e., normally open or normally closed) in the panel. This input is intended to provide an interface to alarm systems, fire panels, or BMS system to override the panel.

9. Panel shall supply current limited low voltage power to other networked devices connected via low voltage network cable.

10. Panel shall be available with NEMA 1 rated enclosure with the following mounting and cover options:

    a. Surface-mounted for all panel sizes

    b. Flush-mounted for up to 16 relay panel sizes

c. Screw-fastened for up to 16 relay panel sizes

d. Hinged cover with keyed lock for all panel sizes

11. Surface-mounted screw cover options for 8 and 16 relay panel sizes shall be plenum rated

12. Panel shall be rated from 0-50C for 8 and 16 enclosure sizes, and 0-45C for 32 and 48 enclosure sizes.

K. Wired Networked Bluetooth® Low Energy Programming Device

1. Device shall be plenum rated and be inline wired, screw mountable.

2. Communication and low voltage power shall be delivered to device via standard low voltage network cabling with RJ-45 connectors.

3. Bluetooth Low Energy connection shall allow connection from smartphone application for programming device settings within the local daisy-chain zone (see list of available settings in section 2.4-System Software Interfaces, Sub-section E).

a. Device shall provide visual indication of remote Bluetooth connection via LED integrated into device enclosure such that it is visible from all angles while the zone is being programmed.

L. Wired Networked Communication Bridge

1. Device shall surface mount to a standard 4” x 4” square junction box.

2. Device shall have 8 RJ-45 ports for connection to lighting control zones (up to 128 devices per port), additional network bridges, and System Controller.

3. Device shall be capable of aggregating communication from multiple lighting control zones for purposes of minimizing backbone wiring requirements back to System Controller.

4. Device shall be powered with Class 2 low voltage supplied locally via a directly wired power supply, or powered via low voltage network connections from powered lighting control devices (e.g. power packs).

5. Wired Bridge shall be capable of redistributing power from its local supply and connected lighting control zones with excess power to lighting control zones with insufficient local power. This architecture also enables loss of power to a particular area to be less impactful on network lighting control system.

PART 3 - EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Installation Procedures and Verification

1. The successful bidder shall review all required installation and pre-startup procedures with the manufacturer’s representative through pre-construction meetings.

2. The successful bidder shall install and connect the networked lighting control system components according to the manufacturer’s installation instructions, wiring diagrams, the project submittals and plans specifications.

3. The successful bidder shall be responsible for testing of all low voltage network cable included in the bid. Bidder is responsible for verification of the following minimum parameters:

    a. Wire Map (continuity, pin termination, shorts and open connections, etc.)

    b. Length

    c. Insertion Loss

B. Coordination with Owner's IT Network Infrastructure

1. The successful bidder is required to coordinate with the owner's representative to secure all required network connections to the owner's IT network infrastructure.

    a. The bidder shall provide to the owner's representative all network infrastructure requirements of the networked lighting control system.

    b. The bidder shall provide to the manufacturer's representative all necessary contacts pertaining to the owner's IT infrastructure, to ensure that the system is properly connected and started up.

C. Documentation and Deliverables

1. The installing contractor shall be responsible for documenting installed location of all networked devices, including networked luminaires. This includes responsibility to provide as-built plan drawing showing device address barcodes corresponding to locations of installed equipment.

2. The installing contractor is also responsible for the following additional documentation to the manufacturer's representative if visualization / graphical floorplan software is provided as part of bid package:

    a. As-Built floor plan drawings showing device address locations required above. All documentation shall remain legible when reproducing\scanning drawing files for electronic submission.

    b. As-Built electrical lighting drawings (reflected ceiling plan) in PDF and CAD format. Architectural floor plans shall be based on as-built conditions.

    c. CAD files shall have layers already turned on/off as desired to be shown in the graphical floorplan background images. The following CAD elements are recommended to be hidden to produce an ideal background graphical image:
    Titleblock
    Text- Inclusive of room names and numbers, fixture tags and drawings notes
    Fixture wiring and homeruns
    Control devices
    Hatching or poché of light fixtures or architectural elements

    d. CAD files shall be of AutoCAD 2018 or earlier. Revit file overall floor plan views shall be exported to AutoCAD 2018.

3.02 SYSTEM STARTUP

A. Upon completion of installation by the installer, including completion of all required verification and documentation required by the manufacturer, the system shall be started up and programmed.

1. For CAT5 wired devices, low voltage network cable testing shall be performed prior to system startup.

B. System start-up and programming shall include:

1. Verifying operational communication to all system devices.

2. Programming the network devices into functional control zones to meet the required sequence of operation.

3. Programming and verifying all sequence of operations.

C. Initial start-up and programming is to occur on-site.

3.03 PROJECT TURNOVER

A. System Documentation

1. Submit software database file with desired device labels and notes completed. Changes to this file will not be made by the factory.

2. Installing contractor to grant access to the owner for the programming database, if requested.

B. Owner Training

1. Provisions for onsite training for owner and designated attendees to be included in submittal package.

END OF SECTION 26 09 43

SECTION 26 23 00 - LOW VOLTAGE SWITCHGEAR

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. This Section specifies the furnishing and installation of low-voltage switchgear consisting of stored energy iron frame power circuit breakers instrumentation and auxiliary devices.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. NEMA SG-3 - Low-Voltage Power Circuit Breakers.
2. NEMA 50-5 - Power Switchgear Assemblies.
3. ANSI C37.13 - Low-Voltage AC Power Circuit Breakers
4. ANSI C37.16 - Preferred Rating for Low-Voltage Power Circuit Breakers.
5. ANSI C37.20 - Switchgear Assemblies including Metal-Enclosed Bus.
6. ANSI C37.50 - Test Procedures for Low-Voltage AC Power Circuit Breakers Used in Enclosures.
7. ANSI C37.51 - Standard for Conformance Testing of Metal-Enclosed Low-Voltage AC Power Circuit Breaker Switchgear Assemblies.
8. NEMA PBI.2 - Application Guide for Ground Protective Devices for Equipment.

1.04 SUBMITTALS

A. Product Data and Record Documents:

1. Provide the following minimum information:
    a. Manufacturer.
    b. One line diagram.
    c. Outline dimensions with trolley.
    d. Total weight of unit.

e. Installation procedures.

f. Operation and maintenance manuals.

g. Instrument transformer data.

h. Coordination study for each type and rating of circuit breaker.

i. A five line diagram (phases, neutral, ground) for each switchgear assembly which shows all connections plus control wiring for zone selective interlocking and PSMS equipment.

j. Torque Specifications for all bus and lug connections.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver units in factory-fabricated, water-resistant wrapping, mounted on shipping skids.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle units carefully to avoid damage to material components, enclosure, and finish. Provide units with adequate lifting means

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Provide completely factory assembled freestanding metal-enclosed drawout switchgear assembly from incoming line lugs to load terminals of all protective devices. Include all necessary buses, supports, devices and provision for future connections as shown on the Drawings.

C. The physical size and configuration of the switchgear may be varied to suit the manufacturer’s standard design, provided all requirements of this Specification are met. Circuit breaker physical arrangement shall be as shown on the Drawings.

2.02 MANUFACTURERS AND CIRCUIT BREAKER TYPE

A. GE Company Type AKD-8.

B. Square D Company Type Power-Zone II.

C. Cutler Hammer/Eaton Type DS.

D. Siemens.

2.03 RATINGS

A. Voltage Characteristics: 480Y/277V or 208Y/120V, three phase, four wire, 60 hertz, unless indicated otherwise on Drawings.

B. Main Bus: Braced to withstand calculated short circuit currents. Ampacity of phase bus is indicated on the Drawings. Neutral bus where required, is the same size as the phase bus.

C. Available Short Circuit Current: Calculated as indicated on the Drawings.

D. Circuit Breaker Interrupting Rating: Calculated as indicated on the Drawings.

2.04 ENCLOSURE

A. Construction:

1. Fabricate the switchgear enclosure with the required number of vertical sections nominally 90 inches high and with width and depth as shown on Drawings.

2. Bolt vertical sections together to provide a rigid, freestanding, metal-enclosed unit which must withstand all shipping, handling and installation procedures without damage or deformation.

3. Completely enclose the frame with removable, bolted, code-gage sheet steel covered panels and hinged doors.

4. Form all cover plates and doors to eliminate sharp edges.

B. Access:

1. In general, the switchgear shall be composed of three (3) compartments front to back: the front compartment being the instrument or circuit breaker compartment, the middle compartment being the bus compartment, and the back compartment being the cable compartment. Front and rear access is required.

2. Provide adequate wiring gutter space at the top, bottom and sides for easy access to all wiring terminations.

3. Provide isolation barriers to separate the incoming conductors from other switchgear cabling.

C. Device Mounting:

1. Provide switchgear with individually mounted protective devices.

2. Assembly must permit interchanging devices of the same type, rating and method of operation.

D. Lifting Provisions:

1. Provide permanent lifting means on top of shipping sections.

2. Include an integral roll-along lifting device for switchgear equipped with drawout devices.

3. Mount lifting device on top of switchgear.

4. Provide all necessary equipment for removal of the circuit breakers.

E. Finish:

1. Grind all steel surfaces smooth, with all burrs, sharp edges, welding splatters, loose rust, scale and the like totally removed after fabrication.

2. Following this, chemically clean and treat steelwork to allow a good bond between the steel surfaces and apply a rust-preventive primer paint.

3. After priming, thoroughly paint the inside and outside with ANSI 49 or ANSI 61 gray paint.

4. Supply one (1) pint of finish paint for each switchgear unit for touch-up after installation.

2.05 BUSES

A. Main, Section and Branch Bus:

1. Material:

a. Fabricate all buses of 98 percent IACS conductivity, tin-plated copper with rounded edges.

b. Make all connections using a minimum of two (2) bolts with conical washers.

2. Design:

a. Size main bus for ampacity shown on Drawings.

b. Determine current rating for section bus and branch bus on the basis of service to all devices including spares and spaces for future addition.

c. Size all buses to limit their temperature rise within the switchgear to 65 degrees C based on a 40 degrees C outside ambient temperature.

d. Size all buses so that current density will not exceed 1000 amperes per square inch.

e. Insulate each individual phase bus bar to withstand 2000 volts AC for one minute.

f. Bus clearances must be rated for 600 VAC.

B. Neutral Bus:

1. In each 4-wire switchgear section, include an uninsulated, tin-plated neutral bus on insulated bus supports secured to the section frame and bolt to neutral bus bars in adjacent sections, to provide a continuous neutral bus.

2. Rate bus for minimum 100 percent of phase current. Refer to Drawings.

C. Ground Bus:

1. In each switchgear section, include an uninsulated tin-plated copper ground bus for the equipment.

2. Secure the bus to the unit frame and bolt to the ground bus in adjacent sections, to provide a continuous equipment ground bus.

3. Arrange the equipment ground bus to ground the switchgear parts that do not carry current.

4. Include terminations at the bus for feeder and branch circuit grounding conductors.

5. The terminations must be exothermically welded on or be of an approved pressure connector type. Make area of ground bus not less than 1.00 square inches.

D. Length:

1. Extend all buses the entire length of the switchgear.

2. Buses must have the required capacity for their total length.

3. Make provisions for extensions from either end of buses if not a double ended unit substation.

E. Insulators:

1. Support main, section and branch bus systems with insulators to provide short circuit bracings.

2. Use noncarbonizing, nontracking insulators.

2.06 DEVICE AND BUS ISOLATION

A. Isolate vertical buses from each other using insulating barriers.

B. Provide insulating barriers between vertical and main bus and between main bus and load terminal.

C. Include barriers at rear and sides of individually mounted devices.

D. Provide horizontal barriers for complete compartmentalization of individually mounted devices.

2.07 PROTECTIVE DEVICES

A. Type: Provide a 100 percent rated, 3-pole, 480V, low-voltage, solid-state trip, nonfused air circuit breaker, unless otherwise noted on Drawings.

B. Operating Mechanism: Stored energy, quick-make, quick-break type.

C. Characteristics:

1. Mounting: Drawout.

2. Operation: Manual.

3. Main and Tie Breaker Trip: Solid-state trip unit with the following functions:

a. Long-time ampere rating and delay.

b. Short-time pickup and delay.

c. Ground fault pickup and delay.

d. Short-time zone selective interlocking.

e. Ground fault zone selective interlocking.

4. Feeder/Branch Breaker Trip: In addition to the requirements for the main and tie circuit breakers, include instantaneous pickup.

D. Accessories:

1. Integral ground fault protection, where required per NEC and as indicated on the Drawings.

2. Ground fault indicating target.

3. Push-to-trip button.

4. Provisions for padlocking in the OPEN position.

5. Zone selective interlocking to allow the circuit breaker to be interlocked with the downstream circuit breakers so that the breaker closest to the fault will clear the fault without disruption of service to other parts of the distribution system.

6. Key interlock arrangement where indicated on the Drawings, which requires one main circuit breaker in a double-ended unit substation to be open before the tie circuit breaker can be closed.

7. Provide shorting blocks for maintenance.

E. Manufacturers:

1. GE Company Type AKE with Microversatrip RMS-9.

2. Square D Company Type DS with Digitrip RMS Series 800.

3. Cutler Hammer/Eaton.

4. Siemens.

2.08 CONTROL WIRING

A. Provide 600-volt, Type SIS wire for switchgear control wiring. Install all control wiring complete at the factory, neatly bundled to protect it from mechanical damage.

2.09 IDENTIFICATION

A. Nameplates:

1. To identify switches, breakers, and other major devices, provide engraved phenolic nameplates with white characters on a black background.

2. Engrave the nameplates with characters a minimum of 3/16 inches high.

3. Mount nameplates on the front of door or panels adjacent to the device, and secure with stainless steel screws.

4. Identify switchgear name, voltage, short circuit ampacity, and source of power.

B. Legend: Indicate on the nameplate legend the name of the circuit, panelboard, motor control center or equipment served by the device.

2.10 LISTING

A. The switchgear shall be UL listed as suitable for use as service entrance equipment.

2.11 SPACE

A. Where indicated on the Drawings, "space" shall mean equipped space ready for inserting a circuit breaker at a future date without any future modifications. Provide current transformers sized according to the breaker frame size.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer’s published recommendations.

C. Field Connections: Make field connections of buses between switchgear sections (rigid connection) and to transformers (flexible metal conduit) with splice bus and hardware provided by the switchgear manufacturer.

D. Equipment Settings:

1. Properly set adjustable current and voltage settings as noted on protective device and relay coordination submittals.

2. Effectively accomplish grounding and bonding.

E. Restore all damaged surfaces to factory finish.

F. Inspection:

1. Thoroughly inspect the switchgear for items such as loose connections and presence of foreign materials and remedy prior to energizing the switchgear.

2. All bolted connections shall be torqued to the manufacturer's recommendations.

G. Double lugging on one protected device to feed two (2) separate loads will not be permitted.

3.02 TESTING

A. After installation and before acceptance by the Owner provide the services of an independent testing organization (independent from the Contractor) to performance test all ground fault relays in accordance with the NEC.

B. Proper operation of the zone selective interlocking feature of the short time and ground fault functions shall be satisfactorily demonstrated to the Owner.

1. This test shall involve passing a primary current through the current sensor with a suitable, low voltage test set and timer, which shall allow verification that the ground fault relays track their published curves and that they actually trip the devices on which they are applied.

2. Trip settings shall be set in accordance with the recommendations and study performed as specified in Section 26 05 73.

C. Notify the Owner's representative of this test date fourteen (14) calendar days in advance so the tests can be properly witnessed. Submit copies of test report per Division 01 requirements.

END OF SECTION 26 23 00

SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. This Section specifies the requirements for all panelboards including electronic grade panelboards.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. NEMA AB 1 – Molded-Case Circuit Breakers, Molded Case Switches, and Circuit-Breaker Enclosures.
2. NEMA PB 1 - Panelboards.
3. NEMA PB 1.1 – General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
4. Federal Specification W-P-115C – Panel, Power Distribution.
5. W-C-375B – Circuit Breakers, Molded Case; Branch Circuit and Service.
6. National Fire Protection Association NFPA 70 – National Electrical Code.
7. NFPA 75 – Protection of Information Technology Equipment.
8. NFPA 780 – Installation of Lightning Protection Systems.
9. Underwriters Laboratories UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations.
10. UL 67 – Panelboards.
11. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures.
12. UL 943 - Ground-Fault Circuit-Interrupters.
13. UL 1283 – Electromagnetic Interference Filters.
14. UL 1449 - Surge Protective Devices.

15. The specified Electronic Grade Panelboards (EGP) shall be designed, manufactured, tested, and installed in compliance with the following standards, in additional to requirements listed above:

    a. American National Standards Institute and The Institute of Electrical and Electronics Engineers ANSI/IEEE C62.41 - Guide for Surge Voltages in Low-Voltage AC Power Circuits.

    b. ANSI/IEEE C62.45 - Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits.

    c. Federal Information Processing Standards Publication 94 - Field Grounding and Shielding Application.

16. The EGP shall be UL 1449 listed as a Transient Voltage Surge Suppressor, and UL 67 listed as a Panelboard. Surge protective device shall be both UL 67 listed and UL 1449 listed. The panel mounted suppression/filter system shall be UL 1449 listed as a Transient Voltage Surge Suppression System.

1.04 SUBMITTALS

A. Product Data:

1. Submit manufacturer's product data for panelboards and circuit breakers.

B. Record Documents:

1. Submit dimensioned Drawings showing size, circuit breaker and equipment arrangement and ratings, including but not limited to, voltage, single or three phase, main bus ampacity, circuit breaker short circuit ampere rating.

2. Equipment arrangement must include panelboard schedules. Panelboard schedules must be identical to the schedules in the project documents unless there is a technical reason for a deviation. Reasons for any deviation shall be included in the Submittal.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver panelboards in factory-fabricated water-resistant wrapping.

B. Handle panelboards carefully to avoid damage to material components, enclosure and finish.

C. Store in a clean, dry space and protected from the weather.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.02 MANUFACTURERS

A. Panelboards:

1. General Electric Company.

2. Square D Company.

3. Cutler Hammer/Eaton.

4. Siemens.

B. Electronic Grade Panelboards:

1. Current Technologies.

2.03 PANELBOARD CONSTRUCTION

A. Provide deadfront circuit breaker type panelboards as scheduled.

B. Enclosure shall be NEMA Type 1 unless otherwise indicated on the Contract Documents.

C. Provide cabinet front with full-height hinged door. Cabinet front shall be cleaned and finished with ANSI 49 or ANSI 61 gray enamel over a rust-inhibiting phosphatized coating. One door over the interior and an additional hinged dead front cover over interior and wireway (door-in-door). Full-height front cover hinged to box with concealed trim clamps. Provide flush door locks.

D. Panelboard boxes (cans) shall be galvanized steel with all cut edges galvanized. Boxes shall not have pre-punched knockouts. All conduit knockouts shall be made in the field.

E. Bus shall be tin-plated copper and braced for the maximum available fault current. Minimum bus ampacity shall be 100 amperes.

F. Circuit breaker phase connector straps that connect the main bus to individual circuit breakers shall be tin-plated copper.

G. Provide a 1 inch x ¼ inch tin-plated copper ground bus in all panelboards. The ground bus shall be drilled to accept lugs for all grounding conductors. Mount ground bus on brackets to allow easy installation of bolts, nuts and lockwashers used to attach ground lugs.

H. Provide a tin-plated copper neutral bus with the same ampacity rating as the phase bus. Neutral bus shall be isolated from the ground bus.

I. All lugs for phase, neutral and ground buses shall be copper or tin-plated copper.

J. Provide compression connectors where conductors terminate directly to bus. (MLO panels).

K. Panelboard electrical ratings and configurations are indicated in the Contract Documents.

L. Circuit directory shall be typewritten and mounted behind clear, heat-resistant plastic in a metal frame, tack welded on the inside of each panel door. List the minimum circuit breaker ampere interrupting capacity on the circuit directory. List minimum panel required interrupting capacity.

M. **Load center type panelboards are not acceptable.** Panelboards shall be full bussed, entire length of panel; 100 ampere or higher panelboard minimum 42-circuits unless noted otherwise.

2.04 SWITCHING AND OVERCURRENT PROTECTIVE DEVICES

A. Provide molded case circuit breakers of manufacturer's standard industrial construction, with integral inverse time delay thermal and instantaneous trip. Provide bolt-on circuit breakers for 208Y/120V, 120/240V panels and 480Y/277V panels.

B. Circuit breakers shall be 125 VDC/240 AC rated for nominal 208Y/120V panels and 480Y/277V rated for nominal 480Y/277V panels. Minimum interrupting ratings shall be 10,000 amperes for 120/208V circuits and 14,000 amperes for 277/480V circuits, unless higher rating noted on the Contract Documents.

C. Breakers 225 ampere through 400 ampere shall have continuously adjustable magnetic pick-ups of approximately five to ten times trip rating.

D. Multi-pole breakers shall be two or three pole as specified. Handle ties are not permitted.

E. Circuit breaker interrupting rating shall be greater than the available short circuit current listed for the panelboard in which the circuit breaker is installed.

F. Panels shall be fully rated. All overcurrent devices shall be capable of interrupting the available fault current.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. Anchor enclosures firmly to metal framing (Unistrut). Metal framing shall be structurally secured to walls and structural surfaces, ensuring that they are permanently and mechanically secured.

D. At the completion of the electrical system, check each phase of all panels under full load and arrange so that all phases shall carry the same load as near as possible.

E. Stub 5 (five) empty 3/4 inch conduits to an accessible location above the ceiling out of each recessed panelboard.

F. Install panelboards such that the center of the circuit breaker in the highest position will not be more than 6-1/2 feet above the floor.

G. Temporary Doors:

1. Protect panelboard cabinets by a temporary door until the panelboard is energized.

2. Temporary doors shall be ¼ inch thick plywood or equivalent rigid material.

3. Temporary doors shall be installed when the cabinet is installed and shall remain closed at all times except when work is being performed inside the panelboard.

H. Permanent Doors and Trim:

1. Install permanent doors and trim immediately before panelboards are energized.

2. Maintain permanent doors and trim in factory condition after installation.

3. Doors shall remain closed at all times except when the panelboard is de-energized and work is taking place within the panelboard.

I. Cabinets:

1. Maintain cabinet interiors clean at all times.

2. Cabinet exteriors shall be maintained free of mud, spray-on insulation, paint spray and all substances not placed on the exterior surface by the panelboard manufacturer.

J. Nameplates:

1. Label each panelboard with a black laminated rigid phenolic nameplate with white core, minimum 3/16 inch high engraved letters.

2. Identify panelboard name, voltage, amperage rating with main lugs only or main circuit breaker, and location of main feed.

K. Panel cabinets shall not be used as raceways or pull boxes for adjacent equipment. Panel cabinets shall not contain wire splices. Panel wiring shall be installed in a neat and workmanlike manner with wire conforming to the contours of the cabinet. Wire bundles shall be wire tied and installed in a manner to protect wire insulation from cover screws and other sharp edges. All phase conductors shall be labeled with a circuit number, readily visible to the panelboard front without removing the dead front cover. All neutral conductors shall be labeled with the circuit number, which they are associated with, within three inches of their termination point.

END OF SECTION 26 24 16

SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. This Section specifies the requirements for wiring devices (wall switches, receptacles, device plate covers, wall dimmers).

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. NEMA WD 1 - General-Purpose Wiring Devices.
2. NEMA WD 2 - Semiconductor Dimmers for Incandescent Lamps.
3. NEMA WD 5 - Specific-Purpose wiring Devices.
4. Americans with Disabilities Act (ADA).
5. ANSI/UL 20 - General Use Snap Switches.
6. ANSI/UL 498 - Attachment Plugs and Receptacles.
7. ANSI/UL 943- Ground Fault Circuit Interrupters.

1.04 SUBMITTALS

A. Product Data:

1. Submit manufacturer's product data for all wiring devices and floor boxes.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Provide factory fabricated wiring devices in the type and electrical rating for the service indicated. Where type and grade are not indicated provide proper selection to correspond with branch circuit wiring and overcurrent protection.

C. Attachment of wires to devices shall be by screw pressure under the head of binding screws. Arrangements depending on spring pressure or tension are not acceptable. All binding screws shall be brass or bronze.

2.02 MANUFACTURERS

A. Wall Dimmers:

1. Lutron.
2. Leviton.
3. Pass & Seymour

B. Lighting Occupancy Sensors:

1. The Watt Stopper.
2. Hubbell.
3. Sensor Switch.
4. Other manufacturers as specifically approved in writing by Owner.

2.03 WALL SWITCHES

A. Type: Quiet type, back and side wired switches as specified herein.

B. Rating: 20 amperes, 120/277 volts.

C. Listing: UL 20 and Federal Specification W-S-896.

D. Finish/Color: As selected by Architect. Provide sample for approval.

2.04 RECEPTACLES

A. Type: Back and side wired receptacles, as specified herein.

B. Rating: Scheduled on Drawings.

C. Listing: UL 498 and Federal Specification W-C-596.

D. Finish: As selected by Architect. Provide sample for approval.

E. All receptacles within 15 feet of a water source shall be a Class A GFCI type.

F. Weatherproof receptacles shall be mounted in a cast steel box with gasketed, weatherproof device plate.

G. Heat trace receptacles shall be Arrow-Hart #5262CRGRY with Crouse Hinds #WLRD-1 cover. Install round plug on cord supplied with heat trace to match weatherproof bushing on receptacle cover for watertight installation.

2.05 DEVICE PLATES

A. Finished Office Areas: Nylon in color as selected by Architect.

B. Kitchen: Stainless Steel.

C. Exposed Boxes in Dry Interior Spaces:

1. Manufacture plates of heavy cadmium-plated sheet steel.

2. Edges of plates must be flush with edges of boxes.

D. Other Areas:

1. Use weatherproof device plates.

2. Provide cast plates with gasketed spring door covers for protection of device.

E. For outlets and switches, provide labeled nameplates listing power source and circuit number. Example: P10 for panel “P” circuit “10”. Label to be tape type black letters on white for normal power.

F. Covers for outlets outdoors shall meet the requirements of latest NEC.

2.06 DEVICE COLOR

A. All switches shall be color as selected by architect.

B. Normal power receptacles shall be color as selected by architect.

C. Isolated ground receptacles shall be orange.

2.07 WALL DIMMERS

A. Wall dimmers shall be linear slide type equal to Lutron Nova Series.

B. Dimmers shall be 600 watts minimum, incandescent, larger size as required to accommodate greater connected loads.

2.08 LIGHT OCCUPANCY SENSORS

A. Lighting occupancy sensors shall be installed as a functioning system per the Contract Documents and manufacturer’s installation instructions.

B. Verify placement and proper application of occupancy sensors per manufacturer recommendations prior to Substantial Completion.

2.09 TELECOMMUNICATION OUTLETS

A. Telecommunication outlets, boxes, sleeves and conduit are part of this Contract.

B. Provide outlet boxes and 3/4-inch conduit with connector and bushing to accessible location above the ceiling.

C. Provide a pull string in each conduit and tie off pull string above ceiling.

D. For floor outlets, provide 1-inch conduit to accessible location above the ceiling on the floor served by the outlet.

PART 3 - EXECUTION

3.01 PREPARATION

A. Contractor must examine the areas and conditions under which wiring devices are to be installed and notify the Owner’s Project Manager in writing of conditions detrimental to the proper and timely completion of the Work.

B. Inspect devices for physical damage.

C. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer’s published recommendations.

C. Wall switch and receptacle ground wiring shall terminate at the wiring device with an insulated tin-plated copper spade compression terminal. Select a spade terminal compatible with the wiring devices supplied so that device screw terminals can be torqued to the wiring device manufacturer's recommendations

D. Wall receptacles shall be installed with the ground pinhole in the up position, unless instructed otherwise by the Owner.

E. The approximate location of switches and receptacles are indicated on the Drawings. These Drawings, however, may not give complete and accurate information in regard to locations of such items. Determine exact locations by reference to the architectural Drawings and by actual measurements during construction of the building before rough-in, subject to the approval of the Owner’s Project Manager.

F. Install wall switches 48 inches above finished floor, OFF position down.

G. Install wall dimmers 48 inches above floor; derate ganged dimmers as instructed by manufacturer; do not use common neutral.

H. Where wainscot is near the 48 inch level, install device in the wall below the top edge of the wainscot and as near the 48 inch level as possible to provide the most pleasing appearance. Do not partially install devices in the wainscot and partially in the wall.

I. Where shown the strike side of doors, install switches and dimmers not less than 2 inches and not more than 12 inches from door trim, but in all cases as close to the 2 inch setback as possible.

J. Verify all doors swings before rough-in and locate switches and dimmers on strike side of door wherever possible.

K. Position the center of convenience, telephone, computer and TV outlets 18 inches above floor or 6inches horizontally above countertops unless otherwise noted. Coordinate with equipment and architectural Drawings. Install outlets vertically on walls and horizontally above countertops.

L. Install specific-use receptacles at heights shown on Drawings.

END OF SECTION 26 27 26

SECTION 26 28 17 - MOTOR AND CIRCUIT DISCONNECTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. This Section specifies the requirements for disconnect switches, fusible and nonfusible.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. Federal Spec. W-S-865 - Switch, Box (Enclosed), Surface Mounted.

2. NEMA KS 1 - Enclosed Switches.

1.04 SUBMITTALS

A. Submit manufacturer’s product data.

B. Submit dimensioned Shop Drawings and equipment ratings for voltage, capacity, horsepower, and short circuit.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver switches individually wrapped in factory-fabricated water-resistant type containers.

B. Handle switches carefully to avoid damage to material components, enclosure and finish.

C. Store switches in a clean, dry space protected from weather.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.02 MANUFACTURERS

A. General Electric Company.

B. Square D Company.

C. Cutler Hammer/Eaton.

D. Siemens.

2.03 FABRICATED SWITCHES

A. Depending upon the service indicated, use 250 or 600 volt switches, single throw, fusible, or nonfusible, horsepower rated, heavy duty, with externally operable handle interlocked to prevent opening of front cover with switch in ON position. Handle designed for locking in "ON" or "OFF" position, in code-gage steel cabinets.

B. Provide defeater so that qualified personnel can open door while switch is in the closed position.

C. Use switches which have number of poles required, dependent upon phase serving equipment.

D. Switches shall be NEMA 1 Underwriters' approved for duty shown. In wet locations, use NEMA 3R. Where exposed to weather in exterior applications, use NEMA Krylon, corrosion resistant type. NEMA 3R and NEMA Krylon switches shall have weatherproof threaded hubs for all conduit entries into switch.

E. Use fuse clips that are rejecting type to accept Class RK or L fuses.

F. Identify switches, as to equipment served, with engraved laminated phenolic name plates. Refer to Section 26 01 00 for nameplate information.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. Install safety or disconnect switches for all electrical equipment, in accordance with the applicable requirements of NEC and the National Electrical Contractors Association "Standard of Installation."

D. For all equipment with motors larger than 1/8 horsepower, provide motor rated disconnect switches within sight of the motor.

E. Disconnect switches for such equipment shall be mounted independent of the unit to allow for maintenance access.

END OF SECTION 26 28 17

SECTION 26 28 20 - ENCLOSED CIRCUIT BREAKERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. This Section specifies the requirements for molded-case and insulated-case circuit breakers in individual enclosures

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. Federal Spec. W-S-865 - Switch, Box (Enclosed), Surface Mounted.

2. NEMA AB 1 Molded Case Circuit Breakers and Molded Case Switches.

3. NETA ATS - Electrical Power Distribution Equipment and Systems

1.04 SUBMITTALS

A. Submit manufacturer’s product data.

B. Submit dimensioned Shop Drawings and equipment ratings for voltage, capacity, horsepower, and short circuit.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver switches individually wrapped in factory-fabricated water-resistant type containers.

B. Handle switches carefully to avoid damage to material components, enclosure and finish.

C. Store switches in a clean, dry space protected from weather.

1.06 EXTRA MATERIALS

A. Supply three of each size and type of current limiters.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.02 MANUFACTURERS

A. General Electric Company.

B. Square D Company.

C. Cutler Hammer/Eaton.

D. Siemens.

2.03 MOLDED CASE CIRCUIT BREAKER

A. Enclosed, molded-case circuit breaker conforming to NEMA AB 1, suitable for use as service entrance equipment where so applied.

B. Service Conditions:

1. Temperature: 100 degrees F.

2. Altitude: 1000 feet.

C. Breakers 300 amp frame or less shall be manufacturer's standard industrial construction, bolt-on type, integral inverse time delay thermal and instantaneous magnetic trip. Breakers 225 ampere through 400 ampere shall have continuously adjustable magnetic pick-ups of approximately five to ten times trip rating.

D. Breakers 400 ampere frame and above shall be equipped with solid-state trip complete with built-in current transformer, solid-state trip unit, Long Time, Short Time, Instantaneous, Ground Fault, Overcurrent Trip and flux transfer shunt trip.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. Install safety switches for all electrical equipment, in accordance with the applicable requirements of NEC and the National Electrical Contractors Association "Standard of Installation."

D. Enclosed Circuit Breakers shall be mounted independent of the equipment to allow for maintenance access.

E. Adjust trip settings so that circuit breakers coordinate with other overcurrent protective devices in circuit.

F. Adjust trip settings to provide adequate protection from overcurrent and fault currents.

END OF SECTION 26 28 20

SECTION 263213
ENGINE GENERATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Packaged engine generator system and associated components and accessories:
   1. Engine and engine accessory equipment.
   2. Alternator (generator).
   3. Generator set control system.
   4. Generator set enclosure.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 231123 - Facility Natural-Gas Piping.

C. Section 235100 - Breechings, Chimneys, and Stacks: Engine exhaust piping.

D. Section 260526 - Grounding and Bonding for Electrical Systems.

E. Section 260529 - Hangers and Supports for Electrical Systems.

F. Section 260548 - Vibration and Seismic Controls for Electrical Systems.

G. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

H. Section 263600 - Transfer Switches.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NECA/EGSA 404 - Standard for Installing Generator Sets 2014.

C. NEMA MG 1 - Motors and Generators 2021.

D. NFPA 37 - Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines 2021.

E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 99 - Health Care Facilities Code 2021, with Amendment.

G. NFPA 110 - Standard for Emergency and Standby Power Systems 2022.

H. UL 1236 - Battery Chargers for Charging Engine-Starter Batteries Current Edition, Including All Revisions.

I. UL 2200 - Stationary Engine Generator Assemblies Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate compatibility of generator sets to be installed with work provided under other sections or by others.
      a. Transfer Switches: See Section 263600.
   2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment or other potential obstructions within the spaces dedicated for engine generator system.
   3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Coordinate the work to provide electrical circuits suitable for the power requirements of the actual auxiliary equipment and accessories to be installed.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Preinstallation Meeting: Convene one week before starting work of this section; require attendance of all affected installers.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features. Include alternator starting capabilities, engine fuel consumption rates, and cooling, combustion air, and exhaust requirements.
   1. Include generator set sound level test data.
   2. Include characteristic trip curves for overcurrent protective devices upon request.
   3. Include alternator thermal damage curve upon request.

C. Specimen Warranty: Submit sample of manufacturer's warranty.

D. Evidence of qualifications for installer.

E. Evidence of qualifications for maintenance contractor (if different entity from installer).

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

G. Manufacturer's factory emissions certification.

H. Maintenance contracts.

1.06 QUALITY ASSURANCE

A. Comply with the following:
   1. NFPA 70 (National Electrical Code).
   2. NFPA 37 (Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines).

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with engine generator systems of similar size, type, and complexity; manufacturer's authorized installer.

D. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide minimum five year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Packaged Engine Generator Set - Basis of Design: Generac Power Systems.

B. Packaged Engine Generator Set - Other Acceptable Manufacturers:
   1. Caterpillar Inc; _____: www.cat.com/#sle.
   2. Cummins Power Generation Inc; _____: www.cumminspower.com/#sle.
   3. Generac Power Systems; _____: www.generac.com/industrial/#sle.Generac Power Systems; _____: www.generac.com/industrial/#sle.Generac Power Systems; _____: www.generac.com/industrial/#sle.
   4. Kohler Co; _____: www.kohlerpower.com/#sle.

C. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

2.02 PACKAGED ENGINE GENERATOR SYSTEM

A. Provide new engine generator system consisting of all required equipment, sensors, conduit, boxes, wiring, piping, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. System Description:
   1. Application: Optional Standby.
   2. Configuration: Single packaged engine generator set operated independently (not in parallel).
   3. Where design is based on single generator set, use of multiple, smaller unit(s) operated in parallel to obtain equivalent total system power rating is not permitted.

D. Packaged Engine Generator Set:
   1. Type: Gaseous (spark ignition).
   2. Power Rating: As indicated on drawings, standby.
   3. Voltage: As indicated on drawings.
   4. Main Line Circuit Breaker:
      a. Type: Thermal magnetic.
      b. Trip Rating: As indicated on drawings.

E. Generator Set General Requirements:
   1. Factory-assembled, with components mounted on suitable base.
   2. List and label engine generator assembly as complying with UL 2200.
   3. Power Factor: Unless otherwise indicated, specified power ratings are at 0.8 power factor for three phase voltages and 1.0 power factor for single phase voltages.
   4. Provide suitable guards to protect personnel from accidental contact with rotating parts, hot piping, and other potential sources of injury.
   5. Main Line Circuit Breakers: Provide factory-installed line side connections with suitable lugs for load side connections.

F. Service Conditions: Provide engine generator system and associated components suitable for operation under the service conditions at the installed location.

G. Starting and Load Acceptance Requirements:
   1. Cranking Method: Cycle cranking complying with NFPA 110 (15 second crank period, followed by 15 second rest period, with cranking limiter time-out after 3 cycles), unless otherwise required.
   2. Cranking Limiter Time-Out: If generator set fails to start after specified cranking period, indicate overcrank alarm condition and lock-out generator set from further cranking until manually reset.
   3. Start Time: Capable of starting and achieving conditions necessary for load acceptance within 10 seconds (NFPA 110, Type 10).
   4. Maximum Load Step: Supports 100 percent of rated load in one step.

H. Exhaust Emissions Requirements:
   1. Comply with federal (EPA), state, and local regulations applicable at the time of commissioning; include factory emissions certification with submittals.
   2. Do not make modifications affecting generator set factory emissions certification without approval of manufacturer and Engineer. Where such modifications are made, provide field emissions testing as necessary for certification.

2.03 ENGINE AND ENGINE ACCESSORY EQUIPMENT

A. Provide engine with adequate horsepower to achieve specified power output at rated speed, accounting for alternator efficiency and parasitic loads.

B. Engine Fuel System - Gaseous (Spark Ignition):
   1. Fuel Source: Natural gas.
   2. Engine Fuel Connections: Provide suitable, approved flexible fuel lines for coupling engine to fuel source.
   3. Provide components/features indicated and as necessary for operation and/or required by applicable codes, including but not limited to:
      a. Carburetor.
      b. Gas pressure regulators.
      c. Fuel shutoff control valves.
      d. Low gas pressure switches.

C. Engine Starting System:
   1. System Type: Electric, with DC solenoid-activated starting motor(s).
   2. Battery(s):
      a. Battery Type: Lead-acid.
      b. Battery Capacity: Size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature; capable of providing cranking through two complete periods of cranking limiter time-outs without recharging.
      c. Provide battery rack, cables, and connectors suitable for the supplied battery(s); size battery cables according to manufacturer's recommendations for cable length to be installed.
   3. Battery-Charging Alternator: Engine-driven, with integral solid-state voltage regulation.
   4. Battery Charger:
      a. Provide dual rate battery charger with automatic float and equalize charging modes and minimum rating of 10 amps; suitable for maintaining the supplied battery(s) at full charge without manual intervention.
      b. Capable of returning supplied battery(s) from fully discharged to fully charged condition within 24 hours, as required by NFPA 110 for Level 1 applications while carrying normal loads.
      c. Recognized as complying with UL 1236.
      d. Furnished with integral overcurrent protection; current limited to protect charger during engine cranking; reverse polarity protection.
      e. Provide integral DC output ammeter and voltmeter with five percent accuracy.
      f. Provide alarm output contacts as necessary for alarm indications.
   5. Battery Heater: Provide thermostatically controlled battery heater to improve starting under cold ambient conditions.

D. Engine Speed Control System (Governor):
   1. Single Engine Generator Sets (Not Operated in Parallel): Provide electronic isochronous governor for controlling engine speed/alternator frequency.
   2. Frequency Regulation, Electronic Isochronous Governors: No change in frequency from no load to full load; plus/minus 0.25 percent at steady state.

E. Engine Lubrication System:
   1. System Type: Full pressure, with engine-driven, positive displacement lubrication oil pump, replaceable full-flow oil filter(s), and dip-stick for oil level indication. Provide oil cooler where recommended by manufacturer.
   2. Oil Heater: Provide thermostatically controlled oil heater to improve starting under cold ambient conditions.

F. Engine Cooling System:

1. System Type: Closed-loop, liquid-cooled, with unit-mounted radiator/fan and engine-driven coolant pump; suitable for providing adequate cooling while operating at full load under worst case ambient temperature.
2. Fan Guard: Provide suitable guard to protect personnel from accidental contact with fan.
3. Coolant Heater: Provide thermostatically controlled coolant heater to improve starting under cold ambient conditions; size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature.

G. Engine Air Intake and Exhaust System:
1. Air Intake Filtration: Provide engine-mounted, replaceable, dry element filter.
2. Engine Exhaust Connection: Provide suitable, approved flexible connector for coupling engine to exhaust system.

2.04 ALTERNATOR (GENERATOR)

A. Alternator: 4-pole, 1800 rpm (60 Hz output) revolving field, synchronous generator complying with NEMA MG 1; connected to engine with flexible coupling; voltage output configuration as indicated, with reconnectable leads for 3 phase alternators.

B. Exciter:
1. Exciter Type: Brushless; provide permanent magnet generator (PMG) excitation system; self-excited (shunt) systems are not permitted.
2. PMG Excitation Short-Circuit Current Support: Capable of sustaining 300 percent of rated output current for 10 seconds.
3. Voltage Regulation (with PMG excitation): Plus/minus 0.5 percent for any constant load from no load to full load.

C. Temperature Rise: Comply with UL 2200.

D. Insulation System: NEMA MG 1, Class H; suitable for alternator temperature rise.

E. Enclosure: NEMA MG 1, drip-proof.

F. Total Harmonic Distortion: Not greater than five percent.

G. Alternator Heater: Provide strip heater to prevent moisture condensation on alternator windings.

2.05 GENERATOR SET CONTROL SYSTEM

A. Provide microprocessor-based control system for automatic control, monitoring, and protection of generator set. Include sensors, wiring, and connections necessary for functions/indications specified.

B. Control Panel:
1. Control Panel Mounting: Unit-mounted unless otherwise indicated; vibration isolated.
2. Generator Set Control Functions:
   a. Automatic Mode: Initiates generator set start/shutdown upon receiving corresponding signal from remote device (e.g. automatic transfer switch).
   b. Manual Mode: Initiates generator set start/shutdown upon direction from operator.
   c. Reset Mode: Clears all faults, allowing generator set restart after a shutdown.
   d. Emergency Stop: Immediately shuts down generator set (without time delay) and prevents automatic restarting until manually reset.
   e. Cycle Cranking: Programmable crank time, rest time, and number of cycles.
   f. Time Delay: Programmable for shutdown (engine cooldown) and start (engine warmup).
   g. Voltage Adjustment: Adjustable through range of plus/minus 5 percent.
3. Generator Set Status Indications:
   a. Voltage (Volts AC): Line-to-line, line-to-neutral for each phase.
   b. Current (Amps): For each phase.
   c. Frequency (Hz).

d. Real power (W/kW).
e. Reactive power (VAR/kVAR).
f. Apparent power (VA/kVA).
g. Power factor.
h. Duty Level: Actual load as percentage of rated power.
i. Engine speed (RPM).
j. Battery voltage (Volts DC).
k. Engine oil pressure.
l. Engine coolant temperature.
m. Engine run time.
n. Generator powering load (position signal from transfer switch).

4. Generator Set Protection and Warning/Shutdown Indications:
   a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following protections/indications:
      1) Overcrank (shutdown).
      2) Low coolant temperature (warning).
      3) High coolant temperature (warning).
      4) High coolant temperature (shutdown).
      5) Low oil pressure (shutdown).
      6) Overspeed (shutdown).
      7) Low fuel level (warning).
      8) Low coolant level (warning/shutdown).
      9) Generator control not in automatic mode (warning).
      10) High battery voltage (warning).
      11) Low cranking voltage (warning).
      12) Low battery voltage (warning).
      13) Battery charger failure (warning).
   b. In addition to NFPA 110 requirements, provide the following protections/indications:
      1) High AC voltage (shutdown).
      2) Low AC voltage (shutdown).
      3) High frequency (shutdown).
      4) Low frequency (shutdown).
      5) Overcurrent (shutdown).
   c. Provide contacts for local and remote common alarm.
   d. Provide lamp test function that illuminates all indicator lamps.
5. Other Control Panel Features:
   a. Event log.

C. Remote Emergency Stop: Provide approved red, mushroom style remote emergency stop button where indicated or required by authorities having jurisdiction.

2.06 GENERATOR SET ENCLOSURE

A. Enclosure Type: Sound attenuating, weather protective.

B. Enclosure Material: Steel or aluminum.

C. Hardware Material: Stainless steel.

D. Color: Manufacturer's standard.

E. Access Doors: Lockable, with all locks keyed alike.

F. Openings: Designed to prevent bird/rodent entry.

G. External Drains: Extend oil and coolant drain lines to exterior of enclosure for maintenance service.

H. Sound Attenuating Enclosures: Line enclosure with non-hydroscopic, self-extinguishing sound-attenuating material.

PART 3 EXECUTION

3.01 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install generator sets and associated accessories in accordance with NECA/EGSA 404.

D. Arrange equipment to provide minimum clearances and required maintenance access.

E. Unless otherwise indicated, mount generator set on properly sized, minimum 6 inch (150 mm) high concrete pad constructed in accordance with Section 033000.

F. Provide required support and attachment in accordance with Section 260529.

G. Provide required vibration isolation and/or seismic controls in accordance with Section 260548.

H. Use manufacturer's recommended oil and coolant, suitable for the worst case ambient temperatures.

I. Provide engine exhaust piping in accordance with Section 235100, where not factory installed.
   1. Include piping expansion joints, piping insulation, thimble, condensation trap/drain, rain cap, hangers/supports, etc. as indicated or as required.
   2. Do not exceed manufacturer's maximum back pressure requirements.

J. Provide grounding and bonding in accordance with Section 260526.

K. Identify system wiring and components in accordance with Section 260553.

3.02 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Notify Owner and Architect at least two weeks prior to scheduled inspections and tests.

C. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

D. Provide all equipment, tools, and supplies required to accomplish inspection and testing, including load bank and fuel.

E. Preliminary inspection and testing to include, at a minimum:
   1. Inspect each system component for damage and defects.
   2. Verify tightness of mechanical and electrical connections are according to manufacturer's recommended torque settings.
   3. Check for proper oil and coolant levels.

F. Prepare and start system in accordance with manufacturer's instructions.

G. Inspection and testing to include, at a minimum:
   1. Verify compliance with starting and load acceptance requirements.
   2. Verify voltage and frequency; make required adjustments as necessary.
   3. Verify phase sequence.
   4. Verify control system operation, including safety shutdowns.
   5. Verify operation of auxiliary equipment and accessories (e.g. battery charger, heaters, etc.).

H. Provide field emissions testing where necessary for certification.

I. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.03 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.04 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Instructor: Manufacturer's authorized representative.
   3. Location: At project site.

3.05 PROTECTION

A. Protect installed engine generator system from subsequent construction operations.

3.06 MAINTENANCE

A. Provide to Owner a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of engine generator system for two years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.

B. Conduct site visit at least once every three months to perform inspection, testing, and preventive maintenance. Submit report to Owner indicating maintenance performed along with evaluations and recommendations.

C. Provide trouble call-back service upon notification by Owner:
   1. Provide on-site response within 4 hours of notification.
   2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
   3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

D. Maintain an on-site log listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced.

END OF SECTION

SECTION 263600
TRANSFER SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Transfer switches for low-voltage (600 V and less) applications and associated accessories:
   1. Automatic transfer switches.
   2. Includes service entrance rated transfer switches.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260529 - Hangers and Supports for Electrical Systems.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 263213 - Engine Generators: For interface with transfer switches.
   1. Includes additional testing requirements.
   2. Includes related demonstration and training requirements.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

C. NEMA ICS 10 Part 1 - Industrial Control and Systems Part 1: Electromechanical AC Transfer Switch Equipment 2020.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.

E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 869A - Reference Standard for Service Equipment Current Edition, Including All Revisions.

G. UL 1008 - Transfer Switch Equipment Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate compatibility of transfer switches to be installed with work provided under other sections or by others.
      a. Engine Generators: See Section 263213.
   2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
   3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Coordinate the work with placement of supports, anchors, etc. required for mounting.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Preinstallation Meeting: Convene one week before starting work of this section; require attendance of all affected installers.

C. Where work of this section involves interruption of existing electrical service, arrange service interruption with Owner.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features.
   1. Where applicable, include characteristic trip curves for overcurrent protective devices upon request.

C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.
   1. Clearly indicate whether proposed short circuit current ratings are based on testing with specific overcurrent protective devices or time durations; indicate short-time ratings where applicable.

D. Specimen Warranty: Submit sample of manufacturer's warranty.

E. Evidence of qualifications for installer.

F. Evidence of qualifications for maintenance contractor (if different entity from installer).

G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

H. Manufacturer’s detailed field testing procedures.

I. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
   1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.

J. Maintenance contracts.

1.06 QUALITY ASSURANCE

A. Comply with the following:
   1. NFPA 70 (National Electrical Code).

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with power transfer systems of similar size, type, and complexity; manufacturer's authorized installer.

E. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store transfer switches in accordance with manufacturer's instructions.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's instructions to avoid damage to transfer switch components, enclosure, and finish.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide minimum five year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Transfer Switches:
   1. Eaton Corporation: www.eaton.com/#sle.
   2. Generac Power Systems: www.generac.com/industrial/#sle.
   3. Schneider Electric; ASCO Power Technologies: www.ascopower.com/#sle.
   4. Source Limitations: Provide transfer switches and accessories produced by single manufacturer and obtained from single supplier.

2.02 TRANSFER SWITCHES

A. Provide complete power transfer system consisting of all required equipment, conduit, boxes, wiring, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Applications:
   1. Utilize open transition transfer unless otherwise indicated or required.
   2. Neutral Switching (Single Phase, Three Wire and Three Phase, Four Wire Systems):
      a. Unless otherwise indicated or required, provide solid (unswitched) neutral.

D. Construction Type: Either "contactor type" (open contact) or "breaker type" (enclosed contact) transfer switches complying with specified requirements are acceptable.

E. Basis of Design - Automatic Transfer Switch: Schneider Electric; ASCO 300 Series: www.ascopower.com/#sle.
   1. Service-Entrance Switch:
      a. Frame: 800 A to 1,200 A.
      b. Transition Configuration: Open-transition.
      c. Neutral Configuration: Solid neutral.
      d. Phase Poles: As indicated on drawings.
      e. Ampere Rating: As indicated on drawings.
      f. Voltage: As indicated on drawings.
      g. Enclosure: As required for installed location.

F. Comply with NEMA ICS 10 Part 1, and list and label as complying with UL 1008 for the classification of the intended application (e.g. emergency, optional standby).

G. Do not use double throw safety switches or other equipment not specifically designed for power transfer applications and listed as transfer switch equipment.

H. Load Classification: Classified for total system load (any combination of motor, electric discharge lamp, resistive, and tungsten lamp loads with tungsten lamp loads not exceeding 30 percent of the continuous current rating) unless otherwise indicated or required.

I. Switching Methods:
   1. Open Transition:
      a. Provide break-before-make transfer without a neutral position that is not connected to either source, and with interlocks to prevent simultaneous connection of the load to both sources.
   2. Obtain control power for transfer operation from line side of source to which the load is to be transferred.

J. Service Conditions: Provide transfer switches suitable for continuous operation at indicated ratings under the service conditions at the installed location.

K. Enclosures:

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
2. Finish: Manufacturer's standard unless otherwise indicated.

L. Short Circuit Current Rating:
1. Withstand and Closing Rating: Provide transfer switches, when protected by the supply side overcurrent protective devices to be installed, with listed withstand and closing rating not less than the available fault current at the installed location as indicated on the drawings.

M. Automatic Transfer Switches:
1. Description: Transfer switches with automatically initiated transfer between sources; electrically operated and mechanically held.
2. Control Functions:
   a. Automatic mode.
   b. Test Mode: Simulates failure of primary/normal source.
   c. Voltage and Frequency Sensing:
      1) Undervoltage sensing for each phase of primary/normal source; adjustable dropout/pickup settings.
      2) Undervoltage sensing for alternate/emergency source; adjustable dropout/pickup settings.
      3) Underfrequency sensing for alternate/emergency source; adjustable dropout/pickup settings.
   d. Outputs:
      1) Contacts for engine start/shutdown (except where direct generator communication interface is provided).
      2) Auxiliary contacts; one set(s) for each switch position.
   e. Adjustable Time Delays:
      1) Engine generator start time delay; delays engine start signal to override momentary primary/normal source failures.
      2) Transfer to alternate/emergency source time delay.
      3) Retransfer to primary/normal source time delay.
      4) Engine generator cooldown time delay; delays engine shutdown following retransfer to primary/normal source to permit generator to run unloaded for cooldown period.
   f. In-Phase Monitor (Open Transition Transfer Switches): Monitors phase angle difference between sources for initiating in-phase transfer.
   g. Engine Exerciser: Provides programmable scheduled exercising of engine generator selectable with or without transfer to load; provides memory retention during power outage.
3. Status Indications:
   a. Connected to alternate/emergency source.
   b. Connected to primary/normal source.
   c. Alternate/emergency source available.
4. Automatic Sequence of Operations:
   a. Upon failure of primary/normal source for a programmable time period (engine generator start time delay), initiate starting of engine generator where applicable.
   b. When alternate/emergency source is available, transfer load to alternate/emergency source after programmable time delay.
   c. When primary/normal source has been restored, retransfer to primary/normal source after a programmable time delay. Bypass time delay if alternate/emergency source fails and primary/normal source is available.
   d. Where applicable, initiate shutdown of engine generator after programmable engine cooldown time delay.

N. Service Entrance Rated Transfer Switches:

1. Furnished with integral disconnecting and overcurrent protective device on the primary/normal source and with ground-fault protection where indicated.
2. Listed and labeled as suitable for use as service equipment according to UL 869A.

O. Interface with Other Work:
1. Interface with engine generators as specified in Section 263213.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of transfer switches are consistent with the indicated requirements.

C. Verify that rough-ins for field connections are in the proper locations.

D. Verify that mounting surfaces are ready to receive transfer switches.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Provide required support and attachment in accordance with Section 260529.

E. Install transfer switches plumb and level.

F. Unless otherwise indicated, mount floor-mounted transfer switches on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 033000.

G. Provide grounding and bonding in accordance with Section 260526.

H. Identify transfer switches and associated system wiring in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Provide services of a manufacturer's authorized representative to observe installation and assist in inspection and testing. Include manufacturer's detailed testing procedures and field reports with submittals.

C. Prepare and start system in accordance with manufacturer's instructions.

D. Automatic Transfer Switches:
1. Inspect and test in accordance with NETA ATS, except Section 4.
2. Perform inspections and tests listed in NETA ATS, Section 7.22.3. The insulation-resistance tests listed as optional are not required.

E. Provide additional inspection and testing as required for completion of associated engine generator testing as specified in Section 263213.

F. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.04 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of transfer switches to Owner, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, and maintenance of transfer switches.
1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Location: At project site.

C. Coordinate with related generator demonstration and training as specified in Section 263213.

3.05 PROTECTION

A. Protect installed transfer switches from subsequent construction operations.

3.06 MAINTENANCE

A. Provide to Owner a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of transfer switches for two years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.

B. Conduct site visit at least once every three months to perform inspection, testing, and preventive maintenance. Submit report to Owner indicating maintenance performed along with evaluations and recommendations.

C. Provide trouble call-back service upon notification by Owner:
   1. Provide on-site response within 4 hours of notification.
   2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
   3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

D. Maintain an on-site log listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced.

END OF SECTION

SECTION 26 43 13 - SURGE PROTECTIVE DEVICES (SPD) – INTEGRATED UNITS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. The Contractor shall furnish and install the Surge Protective Device (SPD) equipment having the electrical characteristics, ratings, and modifications as specified herein and as shown on the contract drawings. To maximize performance and reliability and to obtain the lowest possible let-through voltages, the ac surge protection shall be integrated into electrical distribution equipment such as switchgear, switchboards, panelboards, busway (integrated within bus plug), or motor control centers (MCC).

B. These Specifications describe the requirements for an electrical transient surge suppression filter system integrating both transient voltage surge suppression and electrical high frequency noise filtering for "High Exposure", “Medium Exposure”, and “Low Exposure” locations as defined in ANSI/IEEE C62.41-1991.

C. The unit shall be designed for parallel connection to the facility's wiring system. The suppression filter system shall be designed and manufactured in the USA by a qualified manufacturer of suppression filter system equipment. The qualified manufacturer shall have been engaged in the commercial design and manufacture of such products for a minimum of five (5) years.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. IEEE C62.41.1
2. IEEE C62.41.2
3. IEEE C62.43-2005
4. IEEE C62.45-2002
5. IEEE C62.48-2005
6. IEEE C62.62-2010
7. UL 96A

8. Federal Information Processing Standards Publication 94.

9. National Electrical Manufacturers Association (NEMA LS1-1992).

10. National Fire Protection Association (NFPA 70 [NEC], 75, and 78).

11. Underwriters Laboratories UL 1449 4th Edition or later

12. Underwriters Laboratories 1283 5th Edition or later (Type 2 applications)

1.04 SUBMITTALS

A. Product Data:

1. Provide verification that the SPD complies with the required ANSI/UL 1449 4th Edition or later listing by Underwriters Laboratories (UL). Compliance may be in the form of a file number that can be verified on UL's website www.ul.org, the website should contain the following information at a minimum: model number, SPD Type, system voltage, phases, modes of protection, Voltage Protection Rating (VPR), and Nominal Discharge Current In.

2. Where applicable the following additional information shall be submitted to the engineer:

a. Descriptive bulletins

b. Product sheets

B. Record Documents:

1. Provide Drawings that show unit dimensions, weights, mounting provisions, connection details and layout diagram of the unit.

2. Provide certified documentation of the unit's Single Pulse Surge Current Capacity based on ANSI/IEEE C62.41 Standards.

3. Provide certified documentation of the unit's Minimum Repetitive Surge Current Capacity Testing based on ANSI/IEEE C62.45-2005 Standards.

4. The unit shall include a Diagnostic Signature Card listing factory-established benchmark suppression voltage values for all modes of protection. The suppression voltage values shall be established during final production line testing utilizing the DTS-2 Diagnostic Test Set. This Diagnostic Signature Card shall provide space for subsequent field-testing allowing comparison of the initial factory benchmark testing with subsequent field-testing suppression voltage values.

C. Operation and Maintenance Data:

1. Provide an equipment manual that details the installation, operation and maintenance instructions for the specified unit.

2. Provide a list of customer-replaceable spare parts. All spare parts shall be quickly and easily field-replaceable.

1.05 QUALIFICATIONS

A. The manufacturer of the electrical distribution equipment shall be the manufacturer of the SPD within the listed electrical distribution equipment.

B. For the equipment specified herein, the manufacturer shall be ISO 14001 and ISO 9001 or 9002 certified.

C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of twenty-five (25) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

D. The SPD shall be compliant with the Restriction of Hazardous Substances (RoHS) Directive 2011/65/EU and have a visible label showing compliance.

E. The SPD shall be UL 1449 current edition listed, 20 kA In Type 1 or Type 2 for use in UL 96A systems.

1.06 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of manufacturer's instructions shall be included with the equipment at time of shipment.

1.07 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided with each SPD shipped.

1.08 WARRANTY

A. The manufacturer shall provide a ten (10) year limited warranty from date of shipment against failure when installed in compliance with applicable national/local electrical codes and the manufacturer's installation, operation and maintenance instructions.

B. Warranty shall commence after the Owner has accepted the testing results and taken possession of the equipment.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.02 MANUFACTURERS

A. Current Technology

B. Liebert.

C. Eaton

2.03 ENVIRONMENTAL REQUIREMENTS

A. Storage Temperature: Storage temperature range: -40 degrees to +85 degrees C, (-40 degrees to +185 degrees F).

B. Operating Temperature: Operating temperature range: -40 degrees to +60 degrees C, (-40 degrees to +140 degrees F).

C. Relative Humidity: Reliable operation with 5 percent to 99 percent non-condensing relative humidity.

D. Operating Altitude: Capable operation up to 13,000 feet above sea level.

E. Audible Noise: The unit shall not generate any audible noise.

F. Magnetic Fields: No appreciable magnetic fields shall be generated. Unit shall be capable of use in computer rooms without danger to data storage systems or devices.

2.04 ELECTRICAL REQUIREMENTS

A. Unit Operating Voltage shall be as shown on Drawings.

B. Maximum Continuous Operating Voltage (MCOV) shall be greater than 115 percent of nominal voltage.

C. Operating Frequency: Operating frequency range shall be 47 to 63 Hz.

D. The suppression system shall incorporate thermally protected metal-oxide varistors (MOVs) as the core surge suppression component for the service entrance and all other distribution levels. The system shall not utilize silicon avalanche diodes, selenium cells, air gaps, or other components that may crowbar the system voltage leading to system upset or create any environmental hazards. End of life mode to be open circuit. Unit with end of life short-circuit mode are not acceptable.

E. Unit shall operate without the need for an external overcurrent protection device (OCPD), and be listed by UL as such. Unit must not require external OCPD or replaceable internal OCPD for the UL Listing.

F. Protection Modes – The SPD must protect all modes of the electrical system being utilized. The required protection modes are indicated by bullets in the following table:

	Protection Modes			
Configuration	L-N	L-G	L-L	N-G
Wye	●	●	●	●
Delta	N/A	●	●	N/A
Single Split Phase	●	●	●	●
High Leg Delta	●	●	●	●

G. Nominal Discharge Current (In) – All SPDs applied to the distribution system shall have a 20kA In rating regardless of their SPD Type (includes Types 1 and 2) or operating voltage. SPDs having an In less than 20kA shall be rejected.

H. ANSI/UL 1449 4th Edition Voltage Protection Rating (VPR) – The maximum ANSI/UL 1449 4th Edition VPR for the device shall not exceed the following:

MODES	208Y/120	480Y/277	600Y/347
L-N; L-G; N-G	700	1200	1500
L-L	1200	2000	3000

I. SPD Design

1. Maintenance Free Design – The SPD shall be maintenance free and shall not require any user intervention throughout its life. SPDs containing items such as replaceable single-mode modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.

2. Balanced Suppression Platform – The surge current shall be equally distributed to all MOV components to ensure equal stressing and maximum performance. The surge suppression platform must provide equal impedance paths to each matched MOV. Designs incorporating replaceable SPD modules shall not be accepted.

3. Electrical Noise Filter – Each Type 2 unit shall include a high-performance EMI/RFI noise rejection filter. Noise attenuation for electric line noise shall be up to 50 dB from 10 kHz to 100 MHz using the MIL-STD-220A insertion loss test method. Products unable able to meet this specification shall not be accepted.

    a. Type 2 units with filtering shall conform to UL 1283 5th Edition

    b. Type 1 units shall not contain filtering or have a UL 1283 5th Edition Listing.

4. Internal Connections – No plug-in component modules or printed circuit boards shall be used as surge current conductors. All internal components shall be soldered, hardwired with connections utilizing low impedance conductors.

5. Monitoring Diagnostics – Each SPD shall provide the following integral monitoring options:

    a. Protection Status Indicators - Each unit shall have a green / red solid-state indicator light that reports the status of the protection on each phase.

        1) For wye configured units, the indicator lights must report the status of all protection elements and circuitry in the L-N and L-G modes. Wye configured units shall also contain an additional green / red solid-state indicator light that reports the status of the protection elements and circuitry in the N-G mode. SPDs that indicate only the status of the L-N and L-G modes shall not be accepted.

        2) For delta configured units, the indicator lights must report the status of all protection elements and circuitry in the L-G and L-L modes

        3) The absence of a green light and the presence of a red light shall indicate that damage has occurred on the respective phase or mode. All protection status indicators must indicate the actual status of the protection on each phase or mode. If power is removed from any one phase, the indicator lights must continue to indicate the status of the protection on all other phases and protection modes. Diagnostics packages that simply indicate whether power is present on a particular phase shall not be accepted.

6. Thermal MOV Protection

    a. The unit shall contain thermally protected MOVs. These self-protected MOVs shall have a thermal protection element integrated with the MOV and a mechanical disconnect with arc quenching capabilities in order to achieve overcurrent protection of the MOV. The thermal protection assembly shall disconnect the MOV(s) from the system in a fail-safe manner should a condition occur that would cause them to enter a thermal runaway condition.

7. Fully Integrated Component Design – All of the SPD's components and diagnostics shall be contained within one discrete assembly. The use of plug in single-mode modules that must be ganged together in order to achieve higher surge current ratings or other functionality shall not be accepted.

8. Safety Requirements

   a. The SPD shall minimize potential arc flash hazards by containing no single-mode plug in user serviceable / replaceable parts and shall not require periodic maintenance. SPDs containing items such as replaceable single-mode plug in modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.

   b. SPDs designed to interface with the electrical assembly via conductors shall require no user contact with the inside of the unit. Such units shall have any required conductors be factory installed.

2.05 SYSTEM APPLICATION

A. The SPD applications covered under this section include distribution and branch panel locations, busway, motor control centers (MCC), switchgear, and switchboard assemblies. All SPDs shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category C, B, and A environments.

B. Surge Current Capacity – The minimum surge current capacity the device is capable of withstanding shall be as shown in the following table:

Minimum surge current capacity based on ANSI / IEEE C62.41 location category			
CATEGORY	Application	Per Phase	Per Mode
C	Service Entrance Locations (Switchboards, Switchgear, MCC, Main Entrance)	250 kA	125 kA
B	High Exposure Roof Top Locations (Distribution Panelboards)	160 kA	80 kA
A	Branch Locations (Panelboards, MCCs, Busway)	120 kA	60 kA

2.06 LIGHTING AND DISTRIBUTION PANELBOARD REQUIREMENTS

A. The SPD application covered under this section includes lighting and distribution panelboards. The SPD units shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category B environments.

1. The SPD shall not limit the use of through-feed lugs, sub-feed lugs, and sub-feed breaker options.

2. SPDs shall be installed immediately following the load side of the main breaker. SPDs installed in main lug only panelboards shall be installed immediately following the incoming main lugs.

3. The panelboard shall be capable of re-energizing upon removal of the SPD.

4. The SPD shall be integral to the panelboard and connected directly to the bus. Alternately, an integral SPD can be connected to a circuit breaker for disconnecting purposes, in the case a disconnect is required.

5. The SPD shall be included and mounted within the panelboard by the manufacturer of the panelboard.

6. The SPD shall be of the same manufacturer as the panelboard.

7. The complete panelboard including the SPD shall be UL67 listed.

2.07 SWITCHGEAR, SWITCHBOARD, MCC AND BUSWAY REQUIREMENTS

A. The SPD application covered under this section is for switchgear, switchboard, MCC, and busway locations. Service entrance located SPDs shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category C environments.

B. The SPD shall be of the same manufacturer as the switchgear, switchboard, MCC, or busway

C. The SPD shall be factory installed integral to the switchgear, switchboard, MCC, and/or bus plug at the assembly plant by the original equipment manufacturer

D. Locate the SPD on the load side of the main disconnect device, as close as possible to the phase conductors and the ground/neutral bar.

E. The SPD shall be connected through a disconnect (30A circuit breaker). The disconnect shall be located in immediate proximity to the SPD. Connection shall be made via bus, conductors, or other connections originating in the SPD and shall be kept as short as possible.

F. The SPD shall be integral to switchgear, switchboard, MCC, and/or bus plug as a factory standardized design.

G. All monitoring and diagnostic features shall be visible from the front of the equipment.

2.08 SERVICE ENTRANCE REQUIREMENTS

A. Service entrance located SPDs shall be tested and designed for applications within ANSI/IEEE C62.41 Category C environments.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer’s published recommendations.

3.02 TESTING

A. Each unit shall be factory tested at the applicable MCOV to assure proper field operation.

B. Each unit shall be thoroughly factory tested before shipment. Testing of each unit shall include but shall not be limited to UL manufacturing and production-line tests, quality assurance checks, MCOV and clamping voltage verification tests.

C. Upon completion of installation, a factory-certified local service technician shall provide testing services. The following tests shall be performed:

1. Voltage measurements from Line-to-Ground, Line-to-Neutral, Line-to-Line and Neutral-to-Ground (no neutral in DELTA configurations) at the time of the testing procedure.

2. Impulse injection to verify the system suppression voltage tolerances for all suppression paths. Impulse testing shall be completed while the unit is off-line to isolate the unit from the distribution system.

D. Test results should be recorded and compared to factory benchmark test parameters supplied with each individual unit. A copy of the Start-up test results and the factory benchmark testing results shall be supplied to the Engineer and the Owner for confirmation of proper suppression filter system junction. In addition, the integrity of the neutral-ground bond should be verified through testing and visual inspection.

END OF SECTION 26 43 13

SECTION 26 51 00 - LIGHTING FIXTURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. This Section specifies requirements for indoor and outdoor lighting fixtures, exit signs, lamps driver and controls.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures.

2. NEMA WD1 - General-Purpose Wiring Devices.

3. NFPA 90-A – Standard for the Installation of Air-Conditioning and Ventilating Systems

4. IES LM-80 2015 - Measuring Lumen Maintenance of LED Light Sources

5. UL 8750 - Standard for Safety Light Emitting Diode (LED) Equipment for Use in Lighting Products

6. ANSI/ASHRAE/IESNA Standard 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings.

1.04 SUBMITTALS

A. Product Data:

1. Submit manufacturer's data on lighting fixtures with a separate sheet for each fixture, assembled by luminaire "type” in alphabetical order, with the proposed fixture and accessories clearly labeled.

2. Include dimensions, accessories installation details, and construction details. Photometric data, including CRI, CCT, LED driver type,[aiming diagram,] zonal lumen data, and candlepower distribution data must accompany shop drawings.

3. Submit certification from the luminaire, driver, or dimmer switch manufacturer that ensures compatibility and operability between devices without flickering and to specified dimming levels.

B. Record Documents:

1. Submit dimensioned drawings and performance data including coefficients of utilization, candela distribution, spacing to mounting height ratio, efficiency and visual comfort probability for each fixture, assembled by luminaire type in alphabetical order.

1.05 WARRANTY

A. Provide a written five year minimum replacement warranty for material, lighting fixtures, luminaire finish, and workmanship. Provide written warranty document that contains all warranty processing information needed, including customer service point of contact, whether or not a return authorization number is required, return shipping information, and closest return location to the luminaire location.

B. Material warranty must include:

1. All LED drivers and integral control equipment.

2. Replacement when more than 10 percent of LED sources in any lightbar or subassembly(s) are defective, non-starting, or operating below 70 percent of specified lumen output.

3. Replacement when more than 10 percent of LED sources in any lightbar or subassembly(s) show a color shift greater than 0.003 delta u'v' from the zero hour measurement stated in the IES LM-79 Test Report.

C. Warranty period must begin in accordance with the manufacturer's standard warranty starting date.

D. Lighting Controls Warranty

1. Coverage must begin from date of final system commissioning or three months from date of delivery, whichever is the earliest. Warranty service must be performed by a factory-trained engineer or technician.

2. Unless otherwise noted, provide a written five year minimum warranty on the complete system for all systems with factory commissioning. Provide warranty that covers 100 percent of the cost of any replacement parts and services required over the five years which are directly attributable to the product failure. Failures include, but are not limited to, the following:

3. Software: Failure of input/output to execute switching or dimming commands.

4. Damage of electronic components due to transient voltage surges.

5. Failure of control devices, including but not limited to occupancy sensors, photosensors, and manual wall station control devices.

E. DELIVERY, STORAGE and HANDLING

F. Deliver lighting fixtures individually wrapped in factory-fabricated fiberboard type containers. Parabolic louvers shall be shipped in thermally sealed polyethylene wrapper.

G. Handle lighting fixtures carefully to prevent breakage, denting and scoring the fixture finish. Do not install damaged lighting fixtures.

H. Store product in a clean, dry space protected from weather.

1.06 EXTRA MATERIALS

A. Maintenance Stock:

1. Furnish a stock of replacement lamps in the original cartons or packing sleeves, amounting to 10 percent (but not less than two (2) lamps in each case) of each type and size lamp used in each fixture type.

2. Deliver replacement stock as directed to Owner's storage space

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Lighting fixtures and accessories shall comply with the design and functional requirements of the Project. Design characteristics shall be as noted in manufacturer's submittal data.

C. Provide lighting fixtures of the size, type and rating as scheduled, complete with, but not limited to, lamps, lamp holders, reflectors, ballasts, and wiring.

2.02 MANUFACTURERS

A. Lighting fixtures:

1. As scheduled.

2.03 INTERIOR LIGHTING FIXTURES

A. Complete system with LED drivers and light sources.

B. Minimum L70 lumen maintenance value of 50,000 hours unless otherwise indicated in the luminaire schedule

C. LED driver and light source package, array, or module are accessible for service or replacement without removal or destruction of luminaire.

D. Lenses constructed of heat tempered borosilicate glass, UV-resistant acrylic, or silicone

2.04 LINEAR LED LAMPS

A. Power Factor greater than or equal to 0.90 at full input power and across specified dimming range.

B. Maximum Total Harmonic Distortion (THD) less than or equal to 20 percent at full input power and across specified dimming range.

C. Lumen per watt efficacy no less than 120.

2.05 LED DRIVER

A. Provide LED drivers that are electronic, UL Class 1 or Class 2, constant-current type and that comply with the following requirements:

B. The combined driver and LED light source system does not exceed the minimum luminaire efficacy values as listed in the luminaire schedule provided.

C. Operates for at least 50,000 hours at maximum case temperature and 90 percent non-condensing relative humidity.

D. Integral thermal protection that reduces the output power to protect the driver and light source from damage if the case temperature approaches or exceeds the driver's maximum operating temperature.

E. Class A sound rating.

F. Provide dimming capability as indicated in the luminaire schedule on project plans. Dimmable drivers must be controlled by a [Class 2 low voltage 0-10VDC controller] [Digital Addressable Lighting Interface (DALI)] dimming signal protocol unless otherwise specified. LED drivers of the same family/series must track evenly across multiple luminaires at all light levels.]

G. Provide remote LED Drivers that are UL listed for dry locations typical of interior installations. Provide LED driver in junction box or housing with mounting plate. Housing must allow for field connections to occur inside the housing or must contain mechanical connections.

2.06 LIGHTING CONTROLS

A. Provide lighting control systems that do not switch off battery-operated or emergency backup luminaires or exit signs in path of egress. Provide system with override of lighting control devices controlling luminaires in path of egress with activation of fire alarm system.

B. Provide lighting control system that operates the lighting system as described in the lighting control strategies in the project plans. Submit Sequence of Operation for Lighting Control System describing the operation of the proposed lighting control system and devices. Sequence of Operation must provide the strategies identified in the lighting control strategies.

C. Provide room or area-wide lighting control system capable of manual control, time-based control, and receiving input from photosensors and occupancy/vacancy sensors.

D. Centralized Control Systems

1. Provide a centralized lighting control system capable of manual control, time-based control, receiving input from photosensors and occupancy/vacancy sensors, with the capabilities of controlling, monitoring, and programming changes from one centralized on-site location, and integration with other building systems.

E. Lighting Relay Panel

1. Enclose panel hardware in a [surface][flush]-mounted, NEMA [1][3R][4], painted, steel enclosure with lockable access door and ventilation openings. Internal low-voltage compartment must be separated from line-voltage compartment of enclosure with only low-voltage compartment accessible upon opening of door. Provide additional remote cabinets that communicate back to main control panel as required. Provide Lighting Control Panels that meet the following criteria:

F. Lighting Control Panel

1. Provide an electronic, programmable lighting control panel complete with microprocessor, capable of providing lighting control with input from internal programming, digital switches, time clocks, and other control devices. Enclose Panel hardware in painted, steel enclosure with lockable access door and ventilation openings. Internal low-voltage compartment must be separated from line-voltage compartment of enclosure with only low-voltage compartment accessible upon opening of door. Provide additional remote cabinets that communicate back to main control panel as required.

2. Solid-state, microprocessor-based, internal astronomical time clock. Microprocessor must have nonvolatile memory and must reset automatically after power interruptions of up to 90 days.

3. Interface for providing local programming and control capability, with physical key-locked cover or programmed security access code to prevent unauthorized use.

2.07 EXTERIOR LIGHTING FIXTURES

A. Enclosures shall be complete with gaskets to form weatherproof seal and UL approved for wet locations.

B. In-ground or buried fixture and ballast systems are not approved for use.

C. UL listed for dry or damp location typical of interior installations.

D. Provide exterior building-mounted luminaires that do not exceed the BUG ratings as listed in the luminaire schedule.

2.08 EMERGENCY EXIT SIGNS

A. Provide exit signs with red LED illumination.

B. Exit signs shall have covers that are composed of a black face and body, smooth red diffusion material, with 6 inch-high red letters on black background, directional arrows as indicated. Individual LED's shall not be visible through the diffusion material.

C. Fixtures shall have minimum five (5) year warranty.

D. Fixtures shall be UL924 and Energy Star compliant.

E. Exit signs shall be rated for dual voltage; 120/277.

2.09 LED LIGHTING

A. Shall meet DOE’s Energy Star or Design Light Consortium performance criteria.

B. The luminaire manufacturer shall provide the manufacturer’s name of the LED being used in the luminaire.

C. Shall be UL listed and be furnished complete with LED’s and power supplies.

D. Shall be tested in accordance with LM-79-08 electrical and photometric measurements.

E. The CCT shall be 4000K unless otherwise scheduled.

F. Each luminaire shall carry a 3-year minimum product warranty covering failure of ALL electrical conponents.

2.10 LED POWER SUPPLIES

A. LED power supplies shall operate LEDs within the current limit specification of the manufacturer.

B. Shall operate from 60Hz input source with input power factor >90 percent and a minimum efficiency of 70 percent at full rated load to the driver.

C. Shall have short circuit and overload protection.

D. Shall have a Class A sound rating.

E. Shall contain no PCBs.

F. Power supply output shall be regulated to +/- 5 percent across published load range.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. Install light fixtures in accordance with the manufacturer's written instructions, the applicable requirements of NEC and the National Electrical Contractors Association's "Standard of Installation".

C. If a fixture type designation is omitted, furnish fixture of the same type as shown for rooms of similar usage. Verify with Owner’s Project Manager before purchase and installation.

D. Check the building electrical system requirements and architectural finishes. Regardless of the catalog number prefixes and suffixes shown, furnish fixtures with the proper trim, frames, supports, hangers, ballasts, voltage rating, and other miscellaneous appurtenances to properly coordinate with Project conditions. Verify with Owner’s Project Manager prior to ordering.

E. Check the type of ceilings to be installed in each room and verify that the recessed light fixtures are proper for the type of ceiling to be installed before ordering fixtures. Provide a frame compatible with the type of ceiling in which the recessed lighting fixture is installed. Refer to the Architectural Room Finish Schedule for the specified ceiling type.

F. Fixtures shall be securely attached to the ceiling-framing members by mechanical means. Clips identified for use with the type of ceiling framing member(s) and fixture(s) shall also be permitted. Fasten lighting fixtures in areas where there is no ceiling securely to the structure.

G. Immediately before final observation, clean all fixtures, inside and out, including plastics and glassware, and adjust all trim to properly fit adjacent surface, replace broken or damaged parts, and lamp and test all fixtures for electrical as well as mechanical operation.

H. Protect installed fixtures from damage during the remainder of the construction period.

I. Wiring methods:

1. Lighting fixtures shall be connected to a typical metal conduit, junction box, and wire lighting grid system.

2. Modular cabling, flexible whip assemblies, feed through wiring, ‘daisy-chain’ feeds, tandem wiring and other similar wiring methods are not acceptable for the lighting circuit distribution and wiring system.

3.02 TESTING

A. Upon completion of installation of interior lighting fixtures, and after circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at the Project Site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.

3.03 LIGHTING FIXTURE SCHEDULE

A. Refer to Lighting Fixture Schedule on Drawings for list of specified manufacturers for each fixture proposed.

END OF SECTION 26 51 00

SECTION 28 31 11 – ADDRESSABLE FIRE ALARM SYSTEM

PART 1 GENERAL

1.01 SUBMITTALS

A. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
   1. NFPA 72 "Record of Completion", filled out to the extent known at the time.
   2. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.

1.02 QUALITY ASSURANCE

A. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer , with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.

B. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.

1.03 WARRANTY

A. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.

B. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 FIRE ALARM SYSTEM

A. Fire Alarm System: Provide a new automatic fire detection and alarm system:
   1. Provide all components necessary, regardless of whether shown in Contract Documents or not.
   2. Protected Premises: Entire building shown on drawings.
   3. Evacuation Alarm: Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to general evacuation of entire premises.
   4. Voice Notification: Provide emergency voice/alarm communications with multichannel capability; digital.
   5. Hearing Impaired Occupants: Provide visible notification devices in all public areas.
   6. Fire Alarm Control Unit: New, located at supervising station.

B. Supervising Stations and Fire Department Connections:
   1. Public Fire Department Notification: By remote supervising station.
   2. Remote Supervising Station: UL-listed central station under contract to facility.
   3. Means of Transmission to Remote Supervising Station: Digital alarm communicator transmitter (DACT), 2 telephone lines.

C. Power Sources:
   1. Primary: Dedicated branch circuits of the facility power distribution system.
   2. Secondary: Storage batteries.
   3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
   4. Each Computer System: Provide uninterruptible power supply (UPS).

2.02 FIRE SAFETY SYSTEMS INTERFACES

A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:

1. Sprinkler water control valves.

2.03 COMPONENTS

A. General:
   1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
   2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.

B. Fire Alarm Control Units: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.

C. Initiating Devices:
   1. Addressable Systems:
      a. Addressable Devices: Individually identifiable by addressable fire alarm control unit.
      b. Provide suitable addressable interface modules as indicated or as required for connection to conventional (non-addressable) devices and other components that provide a dry closure output.

D. Circuit Conductors: Copper or optical fiber; provide 200 feet (60 m) extra; color code and label.

E. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.

F. Locks and Keys: Deliver keys to Owner.

G. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and Contract Documents.

B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.

C. Obtain Owner's approval of locations of devices, before installation.

D. Install instruction cards and labels.

3.02 INSPECTION AND TESTING FOR COMPLETION

A. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.

B. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.03 CLOSEOUT

A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.

END OF SECTION

SECTION 28 13 00

ACCESS CONTROL SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1, 8 and 26 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes all labor and materials associated with providing a complete Electronic Access Control System (EAC). The General Contractor shall obtain the services of an authorized, Best Access Systems (BAS) contract distributor with local offices, for furnishing and installing the electronic access control system described herein and as shown on the Contract Drawings. Division 26 shall provide power, conduit, cabling, receptacles and junction boxes.

1.3 SYSTEM DESCRIPTION

A. The Electronic Access Control System basis of design shall be, Stanley PAC System. Provide all access control components including but not limited to: controllers, enclosures, power supplies, reader devices, interface devices, system cards, card enrollment device, network communications interface, software and one client server as required for complete functional system.

1.4 SUBMITTALS

A. Product Data: For each component including nationally recognized testing laboratory listing data.

B. Shop Drawings: Dimensioned plans and elevations showing minimum clearances and installed features and devices for system components. Include a diagram showing interconnection of major system components.

C. Wiring Diagrams: Include diagrams for equipment and for system with all terminals and interconnections identified. Indicate components for both field and factory wiring, and differentiate between factory-and field-installed wiring.

D. Product Certificates: Signed by manufacturers of components certifying that products furnished comply with requirements.

E. Qualification Data: For firms and persons specified in “Quality Assurance” Article.

F. Record of Final Field Tests and Measurements: Include final settings of system.

G. Maintenance Data: Include in maintenance manuals specified in Division 1. Include data for each type of product, including all features and operating sequences, both automatic and manual.

1.5 QUALITY ASSURANCE

A. Comply with NFPA 70, 80 and 101.

1.6 COORDINATION

A. Coordinate quantity and arrangement of assemblies with ceiling space configuration and with components occupying ceiling space, including structural members, pipes, air-distribution components, raceways, cable trays, recessed lighting fixtures, and other items.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products equal to or better than the following:

Stanley Security Solutions, Inc., PAC System

2.2 PRODUCTS AND EQUIPMENT

A. General: The system components shall be of modular design to allow ease of installation, service, future expansion, upgrades and additions to the system.

B. The system shall consist of intelligent controllers with distributed architecture. These controllers shall have operating environments to allow complete functionality at a temperature range of -10° to 55° C and humidity of 0 to 85% RHNC.

2.3 ACCESS AND ALARM SERVER

A. The PAC 500 Access and Alarm Server shall control and communicate with up to 48 door controllers. This device shall have a 10/100Mbps Ethernet connection, allow for SSL (Secure Socket Layer) encrypted IP network communication, and provide a built-in firewall

B. The PAC 500 Access and Alarm Server shall provide for the management and supervision of area anti-pass back across all doors.

C. The Access and Alarm Server shall be a wall mounted module in an enclosure as manufactured. The enclosure panel door shall be equipped with a lock cylinder, and shall be keyed into the existing BEST grand master key system for securing the door.

D. PAC 512 controllers shall be mountable within the same security panel as the Access and Alarm Server module. This device shall be responsible for all access control decision and alarm monitoring detection in the system at the terminal controller level.

E. Each PAC 512 controller shall be capable of maintaining all 20,000 cardholders in the system along with their access levels and time zones at the controller level. Systems that rely on a command from the computer to grant or deny access are not acceptable.

F. Each PAC 512 controller shall be capable of interfacing the following card reader technologies, without the necessity of special interfacing panels or modules. Additional logic panels or personality modules are not acceptable. All reader technologies must be plug for plug compatible. The acceptable technologies are Proximity, Wiegand Swipe, Magnetic Stripe and Keypads. Each terminal controller shall be capable of accepting two readers. In addition, each terminal controller shall also be capable of supporting two Keypads, thus providing Card and PIN logic.

G. The PAC 512 controller shall have all necessary provisions to implement access control for one or two doors. The capacity shall be present for one or two door position contacts, one or two request to exit input devices and one or two door strike outputs. These strike outputs shall control power to the door-locking device and are to be rated at a minimum of 1 Amp at 24 VDC or .5 Amps at 24 VAC. These controllers shall be labeled to insure the correct wire coding is followed and the appropriate devices are wired in the correct locations.

H. As standard, the PAC 512 controller shall provide for additional auxiliary inputs for monitored devices and two additional outputs for controlled devices. The PAC 512 controller shall be STANLEY/PAC product numbers PAC 512 or PAC 512IP. Security panel door shall be equipped with a lock cylinder or padlock, and shall be keyed into the existing District/BEST grand masterkey system.

2.4 INPUT/OUTPUT EXPANSION MODULES

A. The system shall provide the interface of an I/0 module to be directly interfaced to any and all terminal controllers in the system. This interface is accomplished through a manufacture-supplied cable allowing the I/0 board to share the terminal controller logic, terminal controller address and power supply.

B. The I/O board shall be logic driven by the connected terminal controller and allow for the input contact and output control to operate as further specified. These abilities shall exist whether the terminal controller is on-line or off-line to the intelligent system controller.

C. Each input point shall have four (4) state supervision capabilities, i.e., secure, active, short, cut and shall allow a minimum 500 foot, overall shield, 22 gauge twisted wire run to each input device.

D. Each control output shall be single pole, double throw (SPDT) Form C relay. These contacts shall be rated for 1 Amp at 24 VDC or .5 Amp at 24 VAC. All outputs shall be made to allow for any of the following states to be programmed. Outputs shall be configured to latch, close momentarily (programmable from 1 to 120 seconds or 1 to 120 minutes) or set to reflect the state of the corresponding input or inputs. These states shall work in conjunction with outputs being managed under time zones and/or selected Events as well.

2.5 INPUT/OUTPUT ALARM CONTROLLER

A. The system shall provide support for I/0 Alarm Controllers. The input controller shall provide for 20 supervised or non-supervised user inputs. All inputs shall be individually configurable. The

system shall allow for 48 input controllers to be connected to the Alarm and Access Server. The output controller shall allow for the outputs can be configurable.

2.6 AUXILLARY DOOR CONTROL AND EMERGENCY LOCKDOWN PANEL

A. The device shall provide activation and unlocking of select openings as indicated on door schedule and drawings . The controller shall provide for up to 8 user inputs. All inputs shall be individually configurable. Device shall also signal for complete locking of all doors by depressing a N/O contact push button, sending alarm to access panel controller. Additionally interface contact to release all magnetic hold open devices at all openings. Coordination with Fire Alarm system for sequence process. Device shall be furnished under Door Hardware Section 087100, refer to hardware sets for location.

2.7 POWER SUPPLY w/ENCLOSURE

A. UL Listed Power Supply with Enclosure - 12VDC or 24VDC, 2.5A or 4A output (switch selectable), 120VAC input, continuous supply current with enclosure lock and open frame transformer, UPS capable, and battery back-up. Power supply shall be AL300ULX or AL400ULX. Enclosure shall be equipped with lock cylinder and shall be keyed into the existing BEST grand masterkey system, to secure power supply enclosure door.

2.8 ELECTRIFIED CYLINDRICAL CARD READER LOCKSETS

A. Electrified Cylindrical Card Reader Locksets shall be Best Access Systems 9K3M-7-DDEU-15PH-SH-626. Electrified locksets shall be furnished under Door Hardware Section 087100, refer to hardware sets for location.

2.9 DOOR CONTACTS

A. The contact contains a hermetically sealed magnetic reed switch. The reed shall be potted in the contact housing with a polyurethane based compound. Contact and magnet housing shall snap-lock into a ¾" or 1" dia. hole. Housings shall be molded of flame retardant ABS plastic. Color of housings shall be off-white, gray or mahogany brown. The magnet shall be made of Alnico V. Rare Earth Magnet shall be made of neodymium iron boron. Snap-lock insulation bushing for tight fit and maximum gap in steel. Both contact and magnet plastic housings are constructed of one piece of thick-walled ABS plastic for maximum strength and durability. The door contacts must be equal to or better than Sentrol 1078/78CT Series or GRI 180-12WG. Refer to hardware sets for locations

2.10 PROX READER

The proximity card reader shall be provide and must be able to connect to access control panels, which accept the popular clock/data and wiegand signals. A red/green bi-color LED and a beeper should be standard. The LEDs may be operated in one-wire or two-wire mode. Card data is sent using common clock/data or wiegand pulses. The LED and the buzzer are controlled using standard TTL voltage levels. All signal lines are protected from Electrostatic Discharge (ESD). The nominal distance between the card reader and the controller is 500 ft. The polycarbonated UL 94 HB (F1) back plate housing must first be treated with an anti-corrosion film and then coated with a tough, abrasion resistant finish. The reader can be mounted with all stainless steel hardware. This model shall be available in light gray or black. The reader shall be rated for operation from -40° C to +66°C and be suitable for both indoor and outdoor use.

The card reader shall be equal to or better than PAC 7N-28110 . Refer to hardware sets for locations.

2.11 PROX READER ENROLLEMENT DEVICE

The enrollment device shall desk mounted and be provided with interface and line driver of system server. Provide two devices equal to or better than Stanley PAC USBRDR.

2.12 SYSTEM/NETWORK WIRING

A. The Controller communications network shall be made up of a primary main controller bus and secondary terminal controller bus. The communications protocol used shall be RS485. The primary bus and secondary bus shall use a shielded, dual twisted pair, Belden #8723 (20 AWG) or equal. Both bus networks shall be capable of a distance of 4000 ft. total wire. In addition, any point(s) between either the primary and/or secondary bus, shall have the capability of being connected suing Fiber Optics Repeaters. Fiber Optics Repeaters shall provide network wiring capability of a minimum of 4,000 feet between controllers using 62.5 micro-Fiber Optic Cable. The system shall also have the capability of utilizing a standard Static UIP address for LAN/WAN communication capabilities on the Primary Bus.

B. The system communications shall be supervised for integrity. If communications is detected as failed, the system shall report the loss and automatically enable the affected controllers buffer. Systems that require Site Codes, Facility Codes, degrade to these codes and/or do not buffer event information in the event of lost communications are not acceptable.

C. All card reader cabling shall use an overall shield, 5 conductor West Penn $3280 (18 AWG) or equal. A reader shall be wired a minimum of 500 ft. without wire size change. Readers requiring a wire size change or special adapters to drive signal this distance are not acceptable.

D. All electric hardware devices cabling shall use an overall composite stranded and shielded, Belden multiconductor 658AFS (4/18, 4 /22, 2/22, 3/22 twisted AWG) or equal. A device shall be wired a minimum of 200 ft. without wire size change.

E. Door contact cabling shall use an overall shielded, 2 conductor Belden (18 AWG) or equal.

F. Miscellaneous devices cabling shall use unshielded 4 conductor Belden (22 AWG) or equal. Cabling shall be to each device, switch or relay contact

G. Input and Output wire and cable requirements shall be application specific and shall use the proper shielded cable as required by the specific application and/or code.

H. Under Division 26, Electrical Contractor to provide 120V power, receptacles, junction boxes, back boxes cable trays as required and 1/2 inch conduit with cabling requirements installed to each access control device, i.e. card readers, electrified exit devices, electric hinges, electric locks, electric strikes, closers, power supplies, door contacts, and REX. Cabling listed for reference and minimum requirements for installation.

I. Access System Provider shall be responsible for tie-in of all cabling/wiring for a complete system. Coordinate power and conduit requirements for system with Section 087100 and Divisions 26.

2.13 STANLEY PAC ADVANTAGE ACCESS CONTROL APPLICATION SOFTWARE

A. General: This section details the minimum requirements necessary for the application software. The software shall be supported by the following Operating Systems: Microsoft Windows 7, 32 or 64-bit, or Windows 7 Service Pack 1, 32-bit; Windows Vista, 32 or 64-bit, Service Pack 2 required; Windows XP Professional, 32 or 64-bit, Service Pack 3 required. It shall provide an integral solution for incorporating optional Video ID verification and Photo ID Badging and Badge design. The application must, as a standard feature, allow for attaching a photo ID to each cardholder record. The application must additionally allow for Closed Circuit TV Control, Time and Attendance, Paging and other third party linked Microsoft compliant applications.

B. The applications shall be Microsoft ODBC compliant and shall provide a SQL relational database for export of Archive History and cardholder data to third party software and applications. Of primary importance, the system shall be a graphical user interface using standard Microsoft Windows list boxes, option buttons and check boxes and mouse support.

C. The application shall provide an easy to use Graphical User Interface (GUI) with Icons for Event Monitor, Card Holder Database, Reports, System Administration, Installer and Administrator Setup, Operator Action, Alarm Response, Scheduled Reminders, Time Zones, Groups, Events and Operators.

D. At a minimum, the Event Viewer shall allow for four separate Viewing Screens with selectable events vectored to each screen. Each event line shall contain at a minimum, an event number, a date and time, and event type and event description. It shall be possible for the user to select with components of the event lines shall appear in any event viewer screen. It shall be possible for an operator to select viewing on only one viewer screen, two viewer screens, three viewer screens or four viewer screens at any one time. It shall be possible to select and/or restrict, through filters, which events are present any and all viewers based upon the operator currently logged on to the system. It shall also be possible to use standard Windows sizing of the columns for event number, a date and time, an event type and event description.

E. The application shall provide a capability of defining 2,000 doors and 75,000 cardholders. The application shall provide on-screen help to insure an operator’s ability to receive online informational context sensitive help when required. The system points will be identified in English text with assignable definitions of Door, Reader, Keypad, Input and Output points. The application shall allow easy understanding of any event transaction in the system.

2.14 TIME ZONES

A. The application shall provide a minimum of 64 time zones. Time Zones One and Two shall be fixed as Time Zone Never and Time Zone Always respectively. The additional Sixty-two (62) of these time zones shall be Facility definable and have a minimum of 8 definable intervals and shall allow a Facility assigned Time Zone description. These intervals shall be programmable for starting and stopping times assignable to individual days of the week. The intervals shall also define holiday usage. Time zones shall be assignable to doors, readers, cardholders, outputs, inputs and selected system events.

B. Holidays: The application shall provide for enrolling a minimum of 32 holidays annually. Holidays, in conjunction with time zones, shall be assignable to doors, readers, cardholders, outputs, inputs and selected system events. Facility assigned Holiday description shall be possible.

2.15 DOOR ACCESS GROUP PRIVILEGE LEVELS

A. The application shall have the capabilities to relate cardholders to readers for door access by time. It shall be possible to restrict any single cardholder or group of cardholders through the use of access levels. The application shall have a minimum of 256 access group levels and shall allow a Facility assigned description of each. The application shall have the ability to create a privileged cardholder group. This group shall be assignable to any or all reader(s) in the system and those cards assigned shall have 24 hours a day access every day of the year. There shall be a minimum of 8 cardholders assigned privileged group per reader in the system. These privileged groups shall not diminish the 256 access level minimum in the application. The applications shall provide the ability to generate a report on all 256 levels and their Facility assigned definitions.

2.16 GROUP LEVELS

A. Each Card Holder in the system shall be assigned at least one of the 256 Access Level detailing the times, days of the week and holidays that Card Holder shall be granted or denied access to each Reader/Keypad within the system. Additionally, any Cardholder or group of Cardholders may be assigned a second and/or third access level from the list of 256, for access to other groups of readers/keypads. The assigning of a second and/or third level access shall not negate the access granted in the primary access level.

2.17 DOOR AND READER CONFIGURATION

A. The application shall allow all doors and readers to be configured for their own unique requirements. Each door shall be identified in Facility defined text form. Each reader shall be identified in Facility defined text form. The door strike unlock time and door propped open time are to be assignable independently for a minimum of 1 second to up to a maximum of 120 minutes. All door unlocks shall be time zone configurable and once unlocked shall be configured to report state change at Facility's discretion. It is understood that the Request-To-Exit device will be capable of unlocking its related door; additionally, all doors shall be unlockable by a minimum of 2 auxiliary input configured overrides. These inputs shall be described in Facility defined text form and overrides reportable based on an assigned time zone.

B. Each access-controlled door in the system shall have the ability to generate a local alarm output in the event of that door being forced or left open beyond an allowable time. This local alarm output shall be configured to any of the following states: latched or timed. In the event of the output being latched, it shall only be reset through operator intervention or the passing of a valid card at that door's reader. The reporting of these two events shall be time zone definable.

C. The door status shall be configurable to report the physical state of the door based on time and condition. The system shall provide at a minimum Door/Reader/Card Holder status events: Door Left Open, Door Forced, Door Opened and Door Closed, and Admitted, Admit In, Admit Out, Entered, Exited, Expired, Inactive, Is In, Is Out, No Access, Not Time, and Unknown Code. The system shall be capable of reporting by Facility assigned time zone, valid and/or invalid code presentations on a *"per"* reader basis. The system shall also provide for a "False Count" setting of zero to seven invalid code presentations prior to reporting the invalid code event. This feature is necessary when using numeric keypads as reader devices.

D. The application shall allow the Facility to program a message unique to each door and each reader in the system. This message shall appear automatically under alarm conditions for that door or that reader when any status event is set as an Alarm Level Event.

2.18 ANTI-PASS BACK

A. The system shall provide enforcing “Anti-Passback” on doors controlled by an In Reader and an Out Reader. The system shall have a minimum of three methods for anti-Passback forgiveness. The first method allows the system to forgive anti-Passback at the controllers by time. The second method allows the system to forgive anti-Passback by door groups or individual door(s). The third method allows a privileged operator to forgive anti-Passback by cardholders an operator so privileged may invoke any method.

2.19 REQUEST-TO-EXIT

A. Each Request to Exit (REX) device shall be assignable to individual openings on a time zone/holiday basis. If the device is not programmed to deactivate the opening the door contact shall still be shunted upon activation of the request to exit device. Additionally, reporting and archiving of the Request to Exit device Event shall be time zone/holiday assignable.

2.20 INPUT AND OUTPUT CONFIGURATION

A. The application shall allow for a minimum of 4,096 monitored Input points and a minimum of 8,192 controlled Output points to be configured for their own unique requirements. Each input and/or output shall be defined in text form.

B. Each of the input points shall have four (4) state supervision capabilities, i.e., secure, active, short, cut. Any input in the system shall have the ability to report a state change of Secure/Active and Cut/Short. The reporting by these four events shall be Facility definable by time zone.

C. It shall be possible to Shunt any input or group of inputs by an operator so privileged. A system status Reminder shall be stored in the Reminders window, indicating that a Shunt action has been instituted and is in effect. The system Reminder shall only reset upon all inputs being in an Un-Shunted state. It shall be possible to trigger the Reminder of this condition on a minute by minute, hour by hour, or day by day, week by week, month by month, year by year basis as well as to vector this Reminder to selected workstation(s).

D. Each output shall allow for any of the following states to be programmed. Outputs shall be configured to latch, close momentarily (selectable for a minimum of 1 second to a maximum of 120 minutes) or set to follow the state of the corresponding input or inputs. These states shall work in conjunction with outputs being managed under time zones and/or selected Events as well. It shall be possible for an operator so privileged to control outputs from any workstation in the network. Privileged operators may activate outputs individually or in-groups, on a momentary basis or latch outputs on or off using the mouse or menu driven commands.

E. It shall be possible for any input in the system to activate any output or group of outputs in the system. The relationship shall be Local (any input activates any output under its same terminal controller), Regional (any input activates any output under is main controller on any other terminal controller) and Global (any input activates any output under any main controller on any other terminal controller). It shall also be possible for any Event, i.e., Log In, Log Off, Failed, Modified, Traced, etc. to activate any output in the system.

F. It shall be possible for any Access Level to activate any output(s) under a terminal controller thus providing (but not limited to) Facility required Elevator Floor Button control, HVAC control and Alarm shunting.

G. The application shall allow a Facility programmed message unique to each input and each output in the system. This message shall appear automatically under the alarm condition for that input or that output when any status event is set as an Alarm Level Event.

2.21 DEVICE CONFIGURATION AND COPY FEATURE

A. The application shall provide the ability to display a controller, door, reader, input and/or output configuration of any device in the system. While displayed, a privileged operator may modify the configuration if necessary. All or any portion of the configuration of a device may be copied onto any other like device using the time saving Copy Feature of the application.

B. It shall be possible to display a “Tree” of the devices configured and their related addresses at positions within the Threshold controller network. It shall be possible to “Drag and Drop” configured devices from the Inactive list to the Active list and vice versa.

2.22 OPERATOR INTERFACE, ALARM HANDLING AND OVERRIDES

A. Operator Actions: The application shall provide for an operator so privileged, the ability to take action on Doors, Inputs and/or Outputs. Selected “Operators” shall be granted ability to or restricted from, Locking, Unlocking, Momentarily Unlocking or Query Status of any door or group of doors in the systems. Selected “Operators” shall be granted ability to or restricted from, Turning On, Turning Off, Momentarily Turning On/Off or Query Status of any Output or Group of Outputs in the system. Selected “Operators” shall be granted ability to or restricted from, Shunt or Query any Input or Group of Inputs in the System. Selected “Operators” shall be granted ability to or restricted from, Refreshing or Query any Controller or Group of Controllers in the System.

B. It shall be possible to perform operator actions after a simple mouse click on any event displayed in the Event Viewer screen, without additional menu call-ups.

C. Alarm and Status Events – Priorities: The application shall provide Facility, the means to prioritize alarm status events. These events shall be generated from any of the nine event origins. These origins shall be as follows: System Events, Main Controller Events, Terminal Controller Events, cardholder Events, Door Events, Reader Events, Input Events, Output Events and Diagnostic Events.

D. These events shall be configurable to any one of sixteen (16) priority levels, which will display in unique corresponding colors. The color assignment shall permit selections from a basic color chart having samples and shall also provide for the user to configure custom colors down to the Hue, Saturation, and Luminosity level.

E. It shall be possible to route events for display in any one or more of the four event display quadrant screens, and/or printing on any or all display and event printer and event printer devices on the system, based on event type. Each individual device event shall have the ability to be assigned different alarm priority levels in accordance to the needs of the Facility, i.e., Not Time event on Reader One may be assigned Alarm Level Two, but the identical event, Not Time on Reader Two, may only require an Alarm Level six response.

F. Alarm and Status Events – Operator Response: The system shall also be capable of notifying the operator of designated alarms, set over a specific priority level, while the operator is in other access control screens or in other applications.

G. Events set as “Alarm Events” shall also have the ability to be designated as “Breakthrough,” “Flash ICON Notification,” or “Audible.” Alarms for the security operator of the system shall be displayed and made interactive via an Alarm Annunciation screen.

H. “Breakthrough” alarms shall interrupt the operator’s program being run and present the alarm notification box in priority color, at the center of the screen. “Flash ICON Notification” and/or “Audible” alarms shall not breakthrough but will blink or flash the alarm alert ICON to draw the attention of the security operator for response and disposition or sound the internal computer audible device.

I. Alarms shall be displayed based on priority. For each alarm priority queue there shall be a minimum of 256 unacknowledged alarms. All alarms displayed shall have the ability to be acknowledged singularly or as a group based on priority, by an operator so privileged. The application shall provide the ability to enter an operator response documenting action taken. The application shall provide annunciation of alarm events at any or all workstations as allowed by the Windows NT network; based on priority.

J. A simple click of the mouse on any selected “Event” shall bring up a “Detail” window with complete information regarding that particular event.

K. An alternate method of operator response using Icons shall be through the use of Facility Maps and Graphics.

L. Operator Restrictions to Devices and Points: It shall be possible to “partition” the devices, doors, readers, inputs and outputs so as to restrict operators from performing actions on any device their operator privilege levels do not specifically authorize. It shall be possible to “partition” the Card Holder records so as to grant access to only specific Card Holders in a selected group or groups.

2.23 FACILITIES MAPS AND GRAPHICS

A. The application shall be capable of allowing the creation of dynamic and linkable Facility created graphic maps. Applications using a separate video display screen to generate or display maps shall not be acceptable. The application shall be capable of using imported, Facility provided ACAD files for the creation of floor plans.

B. The application graphics shall be able to represent system devices by use of “Icons.” The icons shall be dynamic and reflect real time status of the device it represents. The application shall provide a library of icons per device type in the system as well as allow for unique Facility defined icons. Any icon can be oriented and moved to reflect the actual installation of the device it represents. By selecting an icon in alarm, the application shall display text and alarm message in the same screen as the original map. Applications not able to display alarm text and message in the graphics screen are not acceptable. The application shall be able to allow operators to acknowledge the alarm represented by the chosen icon. Applications that cannot acknowledge the alarm from graphic map shall not be acceptable.

C. The application shall be capable of linking together graphic maps to provide multiple and expanded views of any system device and/or Facility area. The application shall provide links,

each being numbered to represent the map connected to that link. The application shall also allow the Facility to provide a text description for the linked map.

D. These links, like the maps they are associated with, are dynamic and shall display the highest priority color of any device associated with the graphic map the link represents.

E. System graphic map screen format shall allow the display of an alarm queue for all 16-alarm priority levels. This alarm queue shall be real time and each level will increment any changes to alarms in the application at each level. As alarms are acknowledged, the corresponding alarm priority will decrement its queue accordingly. Applications that do not give the system alarm overview as part of graphic map screen are not acceptable.

2.24 CARD HOLDER DATABASE CONFIGURATION

A. The application shall provide an ODBC Microsoft compliant SQL relational database. The application shall have the ability to support unlimited cardholder records, limited only by the size of the systems head-end hard drive. These records shall have at a minimum the following fixed fields: card holder last name, card holder first name, card holder identification number, card holder PIN, card holder access group levels, card holder activation or deactivation status, card/PIN activation and expiration dates and individual card holder TRACE or LOCATION status, and card holder classification, i.e., Employee, Visitor. For ease of use, the application shall provide alphabetical TABS for selecting card holders by name.

B. The application shall also support 32 Facility configurable data fields on eight restricted pages. These fields are necessary for maintaining but not limited to, vehicle license plate numbers, phone numbers, departments, addresses, etc.

C. The application shall provide Facility configurable report capabilities that allow selection; search and sort combinations of any and all fields to be used to create desired reports. These reports once generated shall be displayed and/or printed at Facility's discretion. Additionally, it shall be possible for an operator so privileged to perform a "Quick Search" of cardholder extended date information, example, "Quick Search" an automobile license plate number.

D. The application shall provide the ability to set a validity period on the cardholders. This feature allows a cardholder to be activated and/or deactivated based on specified dates. The application shall provide the ability for cardholders to be placed in a minimum of two classes. These classes shall include Visitors and Standard. It shall be possible to generate a report based on Visitor cardholders only. It shall be possible to place any card holder in a Trace status mode. A Traced card holder shall generate a separate event that may be displayed and/or printed when any Traced Cardholder presents their card at any reader in the system. The Traced Event shall allow tracking of selected individuals throughout a facility.

2.25 EMPLOYEE ID NUMBER AND ANSI STANDARD FORMAT CARDS

A. It shall be possible to set the application software to identify 12 digits of the 48-digit ANSI standard numbering format. This will allow for using Dorado magnetic stripe cards and ICI bar code cards that have been programmed with a card holder's employee identification number plus personal ID number.

2.26 PERSONAL IDENTIFICATION NUMBER

A. It shall be possible to set the application software to require selected entry points to grant access only when a valid Card Holder presents a valid Card in conjunction with a valid Personal Identification Number (PIN). The PIN shall be selectable from one to six digits. It shall be possible to enforce a Card/PIN combination by time zones on a “per” reader basis, thus allowing Card only entry during selected hours.

2.27 DURESS CODE

A. It shall be possible to set a system wide Duress Code that when entered at any Threshold Keypad will grant access to that entry point and in addition alert the Command Center of the Duress situation and entry point.

2.28 OPERATOR PRIVILEGE LEVELS

A. The application shall have a Facility defined number of operators. Any enrolled cardholder may be assigned operator privileges. The application shall allow the Facility to distinguish between operator privileges by defining a minimum of 64 levels. Once defined, these levels shall allow an operator to have restrictions placed on them down to the point level. Each of these operator privilege levels shall be named for their group of operators. These operator privilege levels shall be English text definable.

B. The applications shall provide for segregation of the database both in devices, points, doors, readers, inputs and outputs, as well as Card Holder records. It shall then be possible to restrict any operator or operators from accessing data not specifically authorized by their operator level. This provided for the feature of allowing a security officer to “momentarily” unlock the “lobby” door, for example, yet not be allowed to unlock any other doors in the system. It also provides Facility or tenants the ability to add, modify, delete cardholder records for their specific region, department or company yet preventing access to other regions, departments or companies’ records.

C. An operator may be assigned an Operator Level of *view only* and thereby totally restricting those operators from modifying entries. The system shall alert any operator trying to access a restricted menu selection with an onscreen message. The message shall state “Access Denied – See Your System Administrator.”

D. The application shall provide the capability of generating a report outlining operator privilege capabilities per level and a list of operators assigned to each Operator Level.

2.29 REPORTS

A. The application shall provide at a minimum, the ability to generate reports on the following criteria and allow (or restrict) so privileged operators, access to selective reports or all reports. The application shall allow fo4r the creation of report “Templates” that may be set to filter a report for specific information. Once created, these templates shall be saved as modified for future and continual use. Report templates may only be modified by operators so privileged.

1. Event History Archive (minimum of 64 report templates)
2. Card Holder Configuration (minimum of 64 report templates)
3. Device Status
4. Card Holder Location Status
5. System Version

6. Time Zone and Holiday
7. Access Level Readers
8. Access Level Outputs
9. Input Output Control
10. Operator Level
11. Event Configuration
12. Class Configuration
13. Network Configuration
14. Graphic Configuration
15. Event Generated Output Configuration

2.30 EVENT ARCHIVES

A. The system shall allow event history to be written to the hard drive disk and accumulated as archives. The hard disk drive shall determine the amount of history archived but must support a minimum of 750,000 recorded transactions. Warning messages shall be standard Microsoft Windows in nature. The system shall have the capacity to off-load the archive files onto any standard medium including CD roms, tape drives, 10 Mega Floptical or SyQuest.

2.31 EVENT ARCHIVED HISTORY REPORTS

2.32 The application shall allow reports to be generated from the history accumulated on the system's hard disk drive and/or backup diskettes. The application shall allow any report template to be cleared or modified. Archived templates shall be created through a selection process of event classifications available. This selection allows individual event types to be selected by an all, some or none choice. An operator choosing a "Some" category shall be able to include or exclude any sub-category of any event type. The selection of none excludes the entire event type and all corresponding sub-categories. There shall be a minimum of 64 archive report templates in the application.

2.33 WHO'S IN/WHO'S OUT REPORT

A. The application shall have the capacity to generate a "Quick Status Report," giving a status as to who is in and/or who is out of a specified area. The report generated shall provide the following information: cardholder by name, cardholder access level, in/out status. This report shall be able to be created at any time for any group of readers configured as read in and read out. This report shall be printed and/or screen displayed as desired.

2.34 VIDEO HISTORY

A. The system shall provide as a standard feature, the ability to display a Video Image of each CardHolder as selected Workstations upon a card read. This shall be for the purpose of verifying that the CardHolder is the actual CardHolder of record. A history of these photos shall also be archived thus allowing an operator or administrator to Scroll through the list to see who was admitted at the selected access control point.

2.35 OPERATOR ON-LINE HELP

A. The application shall provide help that is specific to the area of the application being used. The on-line help shall be context sensitive for general help, specific help and glossary of terms. These help screens shall be selectable by a single mouse click of the Help Icon.

2.36 QUERY STATUS OF SYSTEM COMPONENTS

A. It shall be possible to query the status of any or all of the system controllers, access control doors, input and/or output devices. This status shall display dynamically the current state of the device in question. The application shall have the ability to group doors, readers, inputs and outputs into groups. Doors, readers, inputs and outputs shall have a minimum of 256 groups each, for a total of 1,024 groups. Each group shall have the ability to be described in plain English text. Each door, reader, input or output group may contain any number of its system devices and any device may be assigned to more than one group. Group Configuration provides a filtering mechanism during Report Generation and simplifies Operator Actions.

2.37 FILTERS AND USE OF

A. The application shall provide for setting of Filters. Filters allow for placing Doors, Readers, Inputs, Outputs, Main Controllers, Terminal Controllers, and System Events in to a filter or multiple filters. These filters may then be used to easily request information or take action on any device within the selected filter.

2.38 INSTALLATION CONFIGURATION

A. The application shall provide for configuring a “Tree” or “Riser” of system devices consisting of Main Controllers, Terminal Controllers, Doors, Readers, Inputs and Outputs. These system devices shall then be placed in an Active Tree or Riser or kept in a Maintenance Tree or Riser. Placing a Maintenance device into an Active Tree shall be a simple matter of standard Windows “Drag and Drop” into the Active Tree Riser.

2.39 BACKUP AND RESTORATION

A. The application shall provide the ability to archive a minimum of 100,000 events, and generate reports, print selectable to how and when. The software shall have the capability to back-up archival data to a standard 350Mb tape media automatically based on the system internal clock and be capable of formatting either a standard 250 MB tape media in the background. It shall provide the ability to backup and restore archival history, reports, and system configuration database, card and cardholder database.

2.40 ON-LINE MAINTENANCE

A. The application shall provide on-line diagnostics and communications maintenance for adjustment to the operating environment. These diagnostics shall allow for the modification of baud rate, system packet information, and network polling. It shall be possible for the application to adjust the data handshake ability through channel commands and channel response. On-line maintenance providing real-time communications conditions of all system controllers is required.

B. The application shall be required to have ability to generate version report which notifies the operator of the current software version that exists in all NT Stations and polls all main and terminal controllers for current firmware versions of all controllers on the network.

PART 3 - EXECUTION

3.1 INSTALLATION

A. System Contractor shall provide all additional system design work required, including:

1. Conduit layout and sizing
2. Wiring and cable layout and sizing
3. Point-to-point wiring and equipment connection and hook-up information
4. Equipment mounting details
5. Design of equipment cabinets
6. Other detailed design work as required

B. System Contractor's design shall conform to all applicable codes and ordinances. All electrical design, including the sizing and placement of conduit, raceways and conductors, shall be in accordance with NFPA 70: National Electric Code, current adopted edition, unless local codes establish more stringent requirements.

C. System Contractor's design work is subject to review and approval by Electrical Engineer and Facility Manager.

D. Miscellaneous

1. The addition of all wire, cable, conduit, connectors and junction boxes required for system operation.
2. Install low voltage wiring as indicated in the drawings at each door.
3. Complete "as-built" documentation of all security systems, including documentation of existing wiring, conduits and raceways.

E. The General Contractor shall install network jacks and power supplies for security panels in the IDF room. Facility Owner shall be responsible for supplying dedicated IP addresses to these locations. Prior to installation of security panels, verify location with Architect.

3.2 IDENTIFICATION

A. Identify system components, wiring, cabling and terminals according to Division 26, Section "Basic Electrical Materials and Methods." Use color-coded conductors and apply wire and cable marking tape to designate wires and cables so media are identified in coordination with system wiring diagrams.

3.3 FIELD CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation and connections. Report results in writing. Include the following.

1. Operational Test: Start system to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

3.4 ADJUSTMENT

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose without additional cost.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate and maintain services as specified below:

1. Train Owner's maintenance personnel on procedures and schedules for starting up and shutting down, troubleshooting, servicing and maintaining equipment schedules.
2. Review data in maintenance manuals. Refer to Division 1, Section "Operation and Maintenance Data."
3. Schedule training with Owner, through Architect, with at least seven days' advance notice.

Provide:

All components of PAC Software and Access Control System. Refer to door schedule and Section 087100 to identify doors and requirements per door. System 'head end' components will be installed in the IDF rooms or as directed.

1. System Panels/Enclosures as required
2. Alarm and Access, Door, and Input/Output Controllers as required.
3. System wire (low voltage) as required.
4. System power distribution boards as required.
5. Power supplies as required.
6. System back-up batteries as required.
7. System input modules as required.
8. System output modules as required.
9. System prox readers as required.
10. Door contacts as required.
11. 100 proximity cards (35-bit secure).
12. Single and Dual Reader interfaces as required.
13. 12-month parts and labor warranty (or greater if called for elsewhere).
14. System network device(s) as required.
15. Cable for control panel device(s).

Install:

Items in this section and Section 087100 (special-function electrified locks) which are part of the access control system. Integrate as required.

END OF SECTION

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