Project Manual

for

148 N. Oakdale Avenue
Interior Remodel
Salina, Kansas

December 20, 2018

Project No. 17-2919

Set No. _____

148 N. OAKDALE AVENUE
INTERIOR REMODEL
SALINA, KANSAS

Project No. 17-2919

DATE OF DRAWINGS AND SPECIFICATIONS December 20, 2018

OWNER

Domestic Violence Association of Central KS.
203 S. Santa Fe Ave., Salina KS 67401
Andrea Quill, Executive Director
785 827 5862 Fax 785 827 2410

ARCHITECT

JONES GILLAM RENZ ARCHITECTS
730 North 9th, Salina KS 67401
Charles A. Renz, Project Architect
Mark L. Regier, Project Manager
785 827 0386 Fax 785 827 0392

MECHANICAL/ELECTRICAL

LST CONSULTING ENGINEERS
4809 Vue Du Lac Place, Suite 201
Manhattan KS 66503
John Lewis-Smith, P E
785 587 8042 Fax 785 587 8039

STRUCTURAL

MANLEY STRUCTURAL ENGINEERS
107 S. 7th, Salina KS 67401
James T. Manley, P E
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148 N. Oakdale Ave.
Interior Remodel
Salina, Kansas

JONES GILLAM RENZ ARCHITECTS
730 N. 9th, Salina KS 67401
785.827.0386

Project No. 17-2919

INVITATION TO BID

1. Sealed Bids, will be received by **Jones Gillam Renz Architects** for the furnishing of all labor and materials as hereinafter specified for the construction of 148 N. Oakdale Ave - Interior Remodel. Bids will be accepted and opened in the **Conference Room of Jones Gillam Renz Architects at 730 N. 9th Street, Salina, Kansas until 2:00 p.m. Tuesday, January 29th, 2019**. Bids received after this time will not be accepted. Bids will be opened and read publicly

2. PROJECT SCOPE (includes, but not limited to:)
   - A. Interior remodel of mixed-use facility
     1) First floor remodel area of approximately 5,014s.f.
     2) Second floor remodel area of approximately 4,938s.f.
     3) Third floor remodel area of approximately 4,938s.f.
     4) Basement floor area is approximately 4,950s.f., but remodel is minimal.
   - B. Interior demolition of existing plaster or gypsum board over steel stud walls and ceilings. Removal of flooring, mechanical, plumbing and electrical.
   - C. Interior construction
     1) Gypsum board over metal stud wall framing.
     2) Interior finishes: painted and ceramic tile walls, flooring, suspended acoustical and gypsum board ceilings.
     4) Laminate cabinetry, solid core doors.
     5) Replacement of stair finishes including railing systems.
   - D. HVAC
     1) New split system at first and second floors.
     2) New ptac units at third floor.
     3) Slight modifications at basement.
   - E. New plumbing fixtures and associated piping.
   - F. New led lighting.
   - G. New power and data.
   - H. Exterior site work
     1) Two new entry ramps
     2) Asphalt parking lot with minimal areas of concrete paving
     3) Landscaping
     4) Fencing
     5) Window repair

3. PRE-BID CONFERENCE
   The Pre-bid Conference will be held on **Thursday, January 17th, 2019 at 9:00 a.m. local time**. Meet in the first floor conference room at 148 N. Oakdale Ave., Salina KS. Enter through the southeast door. Failure to attend this meeting may be grounds for rejection of the contractor's bid.

4. COMPLETION TIME
   Completion date for the project is July 1, 2019.

5. The GENERAL CONSTRUCTION CONTRACT will include General Construction, Mechanical and Electrical Work combined into one Contract.
   NOTE: GENERAL CONTRACTORS HAVE BEEN PRE-APPROVED FOR BIDDING PURPOSES. THIS IS A CLOSED GENERAL CONSTRUCTION BID.

6. As a condition precedent to Contract Award, type of work completed and proposed Subcontractor will be carefully considered. Owner is not obligated to accept lowest or any other bid.

7. The DRAWINGS, SPECIFICATIONS and CONTRACT DOCUMENTS may be obtained by bona fide Prime Bidders (General, Mechanical and Electrical) from Jones Gillam Renz Architects at 730 North 9th Street Salina KS 67401, 785.827.0386 upon deposit of $200.00 for one set of GENERAL CONSTRUCTION, MECHANICAL AND ELECTRICAL DRAWINGS and SPECIFICATIONS.

Those who submit bids may obtain refund by returning sets in good condition no more than two (2) weeks after bids have been opened. No refund of deposit will be made to Contractors not submitting a bid, unless all documents are returned in good condition five (5) days prior to time of receiving bids. 2nd set of Drawings and Specifications may be purchased by Prime Contractors for $200.00 (no refund)

Drawings and specifications will be available for review on the website at www.jgrarchitects.com. **General Contractors, Mechanical, Plumbing and Electrical Subcontractors who are bidding from documents via website or plan room, must contact the office of Jones Gillam Renz 785.827.0386 to register as an official Plan Holder. Contact Mark Regier, mregier@jgrarchitects.com with questions.**

Partial Sets of Contract Drawings and Documents or individual sheets may be obtained by Subcontractors, material suppliers, etc., (no refund) for the following amounts:

Drawings - $3.50 per sheet
Specification sheets accompanying these drawings, 15¢ per page
Postage and Handling - $8.50 per partial order

CONTRACT DOCUMENTS will be on file and may be examined at the following locations:

Jones Gillam Renz Architects, 730 North 9th Street, Salina, KS 67401
Associated General Contractors of Kansas, 200 W. 33rd, Topeka, KS 66611
KCNR, LLC, 230 Laura Suite 101, Wichita, KS 67211
Dodge Data & Analytics 3315 Central Ave Hot Springs AR 71913
Construct Connect, 30 Technology Parkway South, Ste 100 Norcross GA 30092
Salina Chamber of Commerce Plan Room, 120 West Ash, Salina, KS 67401

8. BID SECURITY in the amount of 5% of the bid must accompany each bid in accordance with INFORMATION FOR BIDDERS.

BY ORDER OF:
Andrea Quill, Executive Director
Domestic Violence Assoc. of Central KS.
Salina KS
December 21, 2018

INFORMATION FOR BIDDERS

1. EXAMINATION

Before submitting his bid, each Bidder shall carefully examine all documents pertaining to the work, visit the site of the work and inform himself as to all existing conditions under which the work will be performed. Submission of a bid will be considered presumptive evidence that the Bidder is fully aware of the conditions of the work, requirements of the Contract Documents, pertinent State and Local codes, conditions of labor and material markets, and has made allowances in his bid for all work and all contingencies. Contractors will not be given extra payments for conditions which can be determined by examining the site and documents.

2. QUESTIONS AND INTERPRETATION OF DOCUMENTS

Should a Bidder be in doubt as to the meaning of any part of the Drawings, Specifications or other proposed Contract Documents and/or find discrepancies in or omissions from the Drawings, Specifications and Contract Documents, he shall contact the Architect immediately per Article 3, Subparagraph 3.2.1 of the AIA General Conditions. Any interpretation of the proposed documents will be made only by Addendum duly issued and copy of such Addendum will be mailed to each person receiving a set of such documents. The Architect and Owner will not be responsible for any other explanation or interpretation of the proposed documents.

3. GENERAL CONSTRUCTION BID

a. The General Construction bid shall incorporate all of the departments of Work (General Construction, Electrical and Mechanical Work) into one (1) bid.

b. The General Contractor shall assume all responsibility for supervision and coordination of the Work.

c. The General Contractor shall furnish Performance and Payment Bonds in the full amount of the Work (Total of General Construction, Electrical and Mechanical Work).

d. The General Contractor shall carry and pay the premium covering the General Construction Work, for Contractors and Subcontractors Insurance as specified in Supplementary Conditions of the Contract.

e. The General Contractor shall submit with his bid, Bid Security in the full amount of the Work (General Construction, Electrical and Mechanical work), as per Paragraph – BID SECURITY.

4. BID PROCEDURE

a. Bids will be received at the time and place stated in the INVITATION TO BID. Bids received after the time stated will be returned unopened.

b. No oral or telephonic bids will be considered, but modifications by telegraph or fax of bids already submitted will be considered if received prior to time set for bid opening.

c. Any addenda issued during the time of preparation of bids are to be acknowledged on the Bid Form and in closing a Contract, they will become a part thereof.

d. Each Bidder is required to bid all alternates included in the Bid Form, except that should he desire not to bid an Alternate, he may insert the words "No Bid" in the space provided for such Alternates. In such case, if it is determined to use such Alternate, the fact that the cost of the material, type or method bid may be lower than that chosen shall not constitute the basis of a claim by the Bidder that the Contract be awarded to him. If an Alternate Price called for involves no change in price, Bidder shall so indicate by writing the words, "No Change" in the space provided. Refer to Section 01019 - SPECIAL PROVISIONS. Each Bidder is required to fill in all unit cost items shown on the Bid Form. Failure to comply may be cause for rejection.

e. Bids are preferred be submitted in DUPLICATE on the forms provided. All blank spaces on the forms shall be fully completed in words as well as figures. Bid Forms must be signed in longhand, with name typed below signature. Where Bidder is a corporation, Bid Forms must be signed with legal name of corporation, followed by the name of the State of Incorporation, the legal signature of an officer authorized to bind the corporation to a contract, Attest and Seal Impression. A copy of the Bid Form is bound herein for the convenience of the Bidders and is not to be detached or filled out. Either contact Architect for copy or make a copy of the form for submittal.

f. Submittals of Bids shall be as follows:
   1) Bids, together with Bid Security, shall be sealed in an opaque envelope, labeled "148 N. OAKDALE AVE. – INTERIOR REMODEL, SEALED BID, DO NOT OPEN" addressed to: JONES GILLAM RENZ ARCHITECTS, ATTN: MARK REGIER, 730 N. 9TH STREET, SALINA KANSAS 67401

   2) If the Bid is mailed, the above shall be addressed to: JONES GILLAM RENZ ARCHITECTS, ATTN: MARK REGIER, 730 N. 9TH STREET, SALINA KANSAS 67401.

5. BID SECURITY

a. Bids shall be accompanied by a Bid Security of not less than five per cent (5%) of the amount of the Bid, which may be a Bid Bond, Certified or Cashiers Check, made payable to the Owner.

b. Such Bid Security shall be submitted with the understanding that it shall guarantee that the Bidder will not withdraw his Bid for a period of sixty (60) days after the scheduled closing time for the receipt of bids; that if his Bid is accepted, he will enter into a formal contract with the Owner in accordance with AIA Document A101, Standard Form of Agreement Between Owner and Contractor, and that the required Performance and Payment Bonds and Statutory Bond, (if required under Section 01019 - SPECIAL PROVISIONS) will be given; and that in the event of the withdrawal of said BID within said period, or the failure to enter into said contract and give said bonds within ten (10) days after he has received notice of the acceptance of his Bid, the Bidder shall be liable to the Owner for the full amount of the Bid Security as representing the damage to the Owner on account of the default of the Bidder in any particular hereof. Bid Securities of the three (3) lowest bidders will be retained until the Contract is awarded or other disposition is made thereof. Bid Bonds of all other bidders will be destroyed unless return to bidders is requested. Certified checks shall be returned to unsuccessful bidders; successful bidders will have checks held until proper Performance and Payment Bonds have been submitted.

6. CONTRACT GUARANTEE

Successful Bidder must deliver to the Owner the following Bonds in an amount no less than 100% of the accepted bid, as security for the faithful performance of the Contract.

a. Performance and Payment Bond as per General Conditions.
b. Statutory Bond, as required in Section 01019 - SPECIAL PROVISIONS.

6. WITHDRAWAL OF BIDS

A bid may be withdrawn on written or faxed request and by request of Contractor personally, received or made prior to time fixed for bid opening. No bid may be withdrawn after opening of bids.

7. INTERPRETATION OF QUOTED PRICES

In case of a difference in written words and figures in a bid, the amount stated in written words shall govern.

8. TIME OF CONSTRUCTION AND PENALTY CLAUSE

Refer to Section 01019 - SPECIAL PROVISIONS.

9. DISQUALIFICATION

The Owner reserves the right to disqualify bids, before or after opening upon evidence of collusion with intent to defraud or illegal practices upon part of the Bidder. Bids will be opened as stated in the Invitation to Bid.

10. SALES TAX EXEMPTION

Refer to Section 01019 - SPECIAL PROVISIONS.

END OF SECTION

148 N. Oakdale Ave. – Interior Remodel, Salina KS
BID FORM

Bid of _____
(Firm Name)

Date _____

BID FORM FOR:

148 N. Oakdale Ave. – Interior Remodel, Salina Kansas
Project No. 17-2919

In compliance with your INVITATION TO BID, the undersigned proposes to furnish all labor and materials and perform all work for the General Construction, including Mechanical and Electrical Work, incidental for the construction and equipping of **148 N. Oakdale Ave. – Interior Remodel, Salina Kansas**, in strict accordance with the Specifications and Drawings dated December 14, 2018 for consideration of the following:

BASE BID _____ DOLLARS

$ _____

The Base Bid includes all allowances as outlined in Section 01019 – Special Provisions.

July 1, 2019 completion date is subject to Penalty Clauses, Section 01019 - SPECIAL PROVISIONS.

The Undersigned acknowledges receipt of the following addenda:

Addendum #1 ____ Addendum #2 _____ Addendum #3 _____ Addendum #4 _____ Addendum #5 _____

ALTERNATE PRICES: For the Alternates as described in the Specifications and/or Drawings, the UNDERSIGNED agrees to ADD or DEDUCT the following amounts to or from the BASE BID as hereinafter itemized:

Alternate No.	**Add**	**Deduct**
Alternate No. 1 Add for Asphalt Parking Lot	$ _____	$ _____
Alternate No. 2 Add for West Entry Façade Upgrade	$ _____	$ _____
Alternate No. 3 Add to Replace 2nd and 3rd Flr. Hallway Doors	$ _____	$ _____
Alternate No. 4 Add to Replace all 3rd Flr. Windows	$ _____	$ _____
Alternate No. 5 (As described by Addendum)	$ _____	$ _____

MAJOR SUBCONTRACTORS:
Bidder shall identify, as part of this Bid, the major Subcontractors he proposes to use in performance of the Work under this Contract.

General Construction (If Not Prime Contractor):

_____
Name, Address

Mechanical Construction

_____
Name, Address

Plumbing Construction

_____
Name, Address

Electrical Construction

_____
Name, Address

I (or WE) FURTHER AGREE AS FOLLOWS:

1. To furnish labor and materials for additional work (except Mechanical and Electrical) ordered by the Owner and for which no pre-agreed upon amount has been determined for the cost of the labor and materials involved plus 10% for overhead and profit.
2. To furnish supervision and coordination for 10% of the cost of additional Mechanical and Electrical work ordered by the Owner.
3. To accept the provisions of Section 01019 – SPECIAL PROVISIONS regarding the date of completion of the Project and Penalty Clause.
4. If written notice of the acceptance of the Bid is mailed, telegraphed or delivered to the Undersigned within 60 days after the date of the opening of the Bids, or anytime thereafter before this Bid is withdrawn, the Undersigned will, within ten (10) days after the date of such mailing, telegraphing or delivery of such notice, execute and deliver a contract in accordance with AIA Document A101, Standard Form of Agreement Between Owner and Contractor, and give Performance Bond in accordance with the Specifications and bid as accepted.
5. That upon failure or refusal to execute and deliver the contract and bonds required within ten (10) days after receipt of notice of acceptance of the Bid, that security deposited with Bid shall be forfeited to the Owner as liquidated damages for such failure or refusal.

DECLARATION:

1. The Undersigned hereby declares that he has carefully examined the Invitation and Information for Bidders, the Drawings and Specifications, has visited the actual location of the Work and has consulted his sources of supply, and has satisfied himself as to all quantities and conditions, and understands that in signing this Bid, he waives all rights to plead any misunderstanding regarding the same.

2. The Undersigned understands that his competence and responsibility and that of his proposed subcontractors, time of completion, as well as any other factors of interest to the Owner will be considered in making the award. The Owner reserves the right to reject any or all bids, to accept or reject alternate bids and unit prices and to waive technicalities concerning the bids received, as it may be in his interest to do so.

_____
(Legal Name of Bidder)

(SEAL, if bid is by a corporation)

_____
(Address of Bidder)

BY _____ in longhand

_____ Typewritten
(Title)

AIA® Document A201™ – 2007

General Conditions of the Contract for Construction

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

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

THE OWNER:
(Name, legal status and address)

THE ARCHITECT:
(Name, legal status and address)

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 BASIC DEFINITIONS

§ 1.1.1 THE CONTRACT DOCUMENTS

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

§ 1.1.2 THE CONTRACT

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

§ 1.1.3 THE WORK

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

§ 1.1.4 THE PROJECT

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

§ 1.1.5 THE DRAWINGS

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

§ 1.1.6 THE SPECIFICATIONS

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

§ 1.1.7 INSTRUMENTS OF SERVICE

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

§ 1.1.8 INITIAL DECISION MAKER

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

§ 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

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

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

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

§ 1.3 CAPITALIZATION

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

§ 1.4 INTERPRETATION

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

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

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

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

§ 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

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

ARTICLE 2 OWNER

§ 2.1 GENERAL

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

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

§ 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or the portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

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

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

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

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

§ 2.3 OWNER'S RIGHT TO STOP THE WORK

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

§ 2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

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

ARTICLE 3 CONTRACTOR

§ 3.1 GENERAL

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

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

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

§ 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

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

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

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

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

§ 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

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

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

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

§ 3.4 LABOR AND MATERIALS

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

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

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

§ 3.5 WARRANTY

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

§ 3.6 TAXES

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

§ 3.7 PERMITS, FEES, NOTICES AND COMPLIANCE WITH LAWS

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

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

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

§ 3.7.4 CONCEALED OR UNKNOWN CONDITIONS

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

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

§ 3.8 ALLOWANCES

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct,

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but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents:

.1 Allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3 Whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

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

§ 3.9 SUPERINTENDENT

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

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

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

§ 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

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

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

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

§ 3.11 DOCUMENTS AND SAMPLES AT THE SITE

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

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§ 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

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

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

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

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

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

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

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

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

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

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled

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to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.13 USE OF SITE

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

§ 3.14 CUTTING AND PATCHING

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

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

§ 3.15 CLEANING UP

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

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

§ 3.16 ACCESS TO WORK

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

§ 3.17 ROYALTIES, PATENTS AND COPYRIGHTS

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

§ 3.18 INDEMNIFICATION

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

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

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

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

§ 4.2 ADMINISTRATION OF THE CONTRACT

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

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

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

§ 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

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

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

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the

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Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

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

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

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

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

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

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

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

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

ARTICLE 5 SUBCONTRACTORS

§ 5.1 DEFINITIONS

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

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

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

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

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

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

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

§ 5.3 SUBCONTRACTUAL RELATIONS

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

§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

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

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

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

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

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

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

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

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

§ 6.2 MUTUAL RESPONSIBILITY

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

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

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

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

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

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§ 6.3 OWNER'S RIGHT TO CLEAN UP

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 GENERAL

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

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

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

§ 7.2 CHANGE ORDERS

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

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

§ 7.3 CONSTRUCTION CHANGE DIRECTIVES

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

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

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

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 Unit prices stated in the Contract Documents or subsequently agreed upon;
.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
.4 As provided in Section 7.3.7.

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

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

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

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

.1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;

.2 Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and

.5 Additional costs of supervision and field office personnel directly attributable to the change.

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

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

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

§ 7.4 MINOR CHANGES IN THE WORK

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

ARTICLE 8 TIME

§ 8.1 DEFINITIONS

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

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

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

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

§ 8.2 PROGRESS AND COMPLETION

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

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

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furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

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

§ 8.3 DELAYS AND EXTENSIONS OF TIME

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

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

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 CONTRACT SUM

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

§ 9.2 SCHEDULE OF VALUES

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

§ 9.3 APPLICATIONS FOR PAYMENT

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

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

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

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

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the

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Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§ 9.4 CERTIFICATES FOR PAYMENT

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

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

§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION

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

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a separate contractor;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- **.7** repeated failure to carry out the Work in accordance with the Contract Documents.

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

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

§ 9.6 PROGRESS PAYMENTS

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

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

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

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

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

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

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

§ 9.7 FAILURE OF PAYMENT

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

§ 9.8 SUBSTANTIAL COMPLETION

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

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

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

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

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

§ 9.9 PARTIAL OCCUPANCY OR USE

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

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

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

§ 9.10 FINAL COMPLETION AND FINAL PAYMENT

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

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

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

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

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

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 SAFETY PRECAUTIONS AND PROGRAMS

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

§ 10.2 SAFETY OF PERSONS AND PROPERTY

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

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

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

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

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

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

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

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

§ 10.2.8 INJURY OR DAMAGE TO PERSON OR PROPERTY

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

§ 10.3 HAZARDOUS MATERIALS

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

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

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

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

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

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

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§ 10.4 EMERGENCIES

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

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 CONTRACTOR'S LIABILITY INSURANCE

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

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

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

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

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

§ 11.2 OWNER'S LIABILITY INSURANCE

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

§ 11.3 PROPERTY INSURANCE

§ 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's

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

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

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

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

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

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.2 BOILER AND MACHINERY INSURANCE

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

§ 11.3.3 LOSS OF USE INSURANCE

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

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

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

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

§ 11.3.7 WAIVERS OF SUBROGATION

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

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

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

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

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

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

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

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 UNCOVERING OF WORK

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

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

§ 12.2 CORRECTION OF WORK

§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

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

§ 12.2.2 AFTER SUBSTANTIAL COMPLETION

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

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

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

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

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

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

§ 12.3 ACCEPTANCE OF NONCONFORMING WORK

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

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ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 GOVERNING LAW

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

§ 13.2 SUCCESSORS AND ASSIGNS

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

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

§ 13.3 WRITTEN NOTICE

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

§ 13.4 RIGHTS AND REMEDIES

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

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

§ 13.5 TESTS AND INSPECTIONS

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

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

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

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

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

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

§ 13.6 INTEREST

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

§ 13.7 TIME LIMITS ON CLAIMS

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

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 TERMINATION BY THE CONTRACTOR

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

- **.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- **.2** An act of government, such as a declaration of national emergency that requires all Work to be stopped;
- **.3** Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- **.4** The Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

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

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

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

§ 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1 The Owner may terminate the Contract if the Contractor

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

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

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

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

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

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

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

§ 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

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

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

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

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

§ 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

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

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

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

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

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 CLAIMS

§ 15.1.1 DEFINITION

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

§ 15.1.2 NOTICE OF CLAIMS

Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker.

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Claims by either party must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3 CONTINUING CONTRACT PERFORMANCE

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

§ 15.1.4 CLAIMS FOR ADDITIONAL COST

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

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME

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

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

§ 15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

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

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

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

§ 15.2 INITIAL DECISION

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

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

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

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

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

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

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

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

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

§ 15.3 MEDIATION

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

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

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

§ 15.4 ARBITRATION

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

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

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

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

§ 15.4.4 CONSOLIDATION OR JOINDER

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

§ 15.4.4.2 Either party, at its sole discretion, may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

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

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SUPPLEMENTARY CONDITIONS OF THE CONTRACT

1. DEFINITIONS - Supplement Paragraph 1.1 as follows:

   a. When words such as approved, proper, satisfactory, equal, and as directed are used, they imply such reference to the Architect's specific approval and directions.

   b. Provide means to furnish and install.

   c. The provisions of the Agreement take precedence over all other Contract Documents.

2. WARRANTY - Supplement Paragraph 3.5.1 as follows:

   a. Contractor warrants to Owner and Architect that on receipt of notice from either of them, within the period of one (1) year following date of Substantial Completion, that defects in materials and/or workmanship have appeared in the Work, Contractor will promptly correct such defects to the state of condition originally required by the Contract Documents at Contractor's expense.

3. SHOP DRAWINGS - Supplement Paragraph 3.12 as follows:

   a. The Contractor shall submit **one (1) electronic copy** of all Shop or Setting Drawings and Schedules required for the work of the various trades, after same have been checked and compared with the Contract Document Requirements, and after checking with field conditions at the job and so certified on the Drawings by the Contractor. Above Drawings will not be checked by Architect unless same bear certification.

   b. Architect's approval is subject to notations on Drawings, Compliance with Drawings and Specifications, and conditions and measurements at project. Measurements and quantity not checked or approved.

4. SAMPLES - Supplement Subparagraph 3.12.3 as follows:

   a. All samples as called for in the various Sections of this Specification and any other samples, as directed, shall be furnished by the Contractor for approval.

   b. All samples of materials that require approval as to color, texture, finish and type shall be furnished at the same time, so that an intelligent selection of colors and textures may be made by the Architect.

5. COLOR SELECTIONS

   a. The Contractor shall provide for and coordinate into the project construction schedule, a 6-week time frame for the Architect/Designer to make final color selections from Contractor's submittals, obtain approval from the Owner and to submit a color schedule, indicating what colors go where, to the Contractor. Time frame begins when Architect has received 100% of submittals listed below.

   b. Submittals, i.e., actual samples, manufacturers' literature, full color line options, etc., shall include as a minimum, but not limited to:
      Carpet Types
      Sheet Vinyl Flooring
      Vinyl Composition Tile Flooring
      Vinyl Base
      Ceramic Wall Tile
      Ceiling Types
      Paint
      Corner Guards
      Plastic Laminate (Manufacturer)
      Wood Stain for Doors and Woodwork
      Aluminum Storefront System

6. CLEAN UP - Supplement Paragraph 3.15 as follows:
   a. Each Contractor shall, at all times, remove any and all of his rubbish from the buildings and grounds and keep the building site clean.

b. In addition to the general broom cleaning, the General Contractor shall do the following special cleaning for all trades at the completion of the work:

1) Glass. Remove putty, stains and paint from all glass and wash and polish same. Care shall be taken not to scratch the glass.

2) Painted, Decorated, and Stained Work. Remove all marks, stains, fingerprints and other soil or dirt from all painted, decorated and stained work.

3) Temporary Protection. Remove all temporary protections; clean and polish all floors at completion.

4) Woodwork. Clean and polish all woodwork upon completion.

5) Hardware. Clean and polish all hardware for all trades. This shall include removal of all stains, dust, dirt, paint, etc., upon completion.

6) Tile Work. Remove all spots, soil and paint from all tile work, wash same upon completion.

7) Fixtures and Equipment. Clean all fixtures and equipment, removing all stains, paint, dirt and dust.

c. All combustible rubbish, and all debris and other rubbish shall be removed entirely from the premises.

7. MUTUAL RESPONSIBILITY OF CONTRACTORS - Supplement Paragraph 6.2 as follows:

a. General Contractor shall assume general coordination and direction of the project. General Contractor shall cooperate with Mechanical and Electrical Contractors and other subcontractors and/or suppliers on the Work and install their work in sequence to facilitate and not delay the completion of the project. The Architect is not the coordinator or expeditor of the work of the contractors and/or subcontractors referred to hereinbefore.

8. CHANGES IN THE WORK

Refer to Paragraph 7.2 and insert the following:

a. Whenever a Change Order involves net cost decrease, the CREDIT to the Owner shall be such net cost decrease. Whenever a Change Order involves a summary net increase, the Contract shall be increased by the amount of such net cost increase plus 10% of such net cost for overhead and profit. The General Contractor will furnish supervision and coordination for 10% of the cost of additional Mechanical and Electrical work ordered by the Owner.

b. The Contractor shall furnish the Owner an itemized accounting with supporting data used in computing the value of any change that might be ordered.

c. Change Orders must state a number of added days or days to be deleted from completion time. If no change in days is required by the change order, write NONE. Failure to comply with above voids any later request for extra time.

9. APPLICATION FOR PROGRESS PAYMENTS AND CERTIFICATION FOR PAYMENT

a. Amend Subparagraph 9.3.1 and insert the following: On or before the 25th day of each month, the Contractor shall submit to the Architect an itemized Application for Payment supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require.

b. Amend Subparagraph 9.4.1 and insert: If the Contractor has made application for payment as above, the Architect will, with reasonable promptness and within seven (7) days after receipt of the application, issue an application for payment to the Owner, with a copy to the Contractor in the amount of 90% of the value of the Contract the Architect determines has been completed to the date of application, thus a 10% retainage, less any amount paid to the Contractor, or state in writing his reason for withholding an application as provided in Subparagraph 9.5.1.

c. Date of payment of the Application for Payment by the Owner is hereby defined as the earliest possible date that the Owner can prepare vouchers after receipt of Application for Payment from the

Architect and approval of same by any governing body of the Owner and issuance of vouchers to cover Application for Payment.

10. CONTRACTOR'S LIABILITY INSURANCE

a. Workers' Compensation and Employers Liability Insurance - Refer to Subparagraph 11.1.1.

b. Bodily Injury and Property Damage - Refer to Subparagraph 11.1.2. Limits shall be as follows:
(1) Limits of liability coverage shall be $1,000,000.00 Combined Single Limit for Bodily Injury and Property Damage.

c. Owner's Protective Liability Insurance - Refer to Paragraph 11.2 - Owner's Option.

11. PERFORMANCE AND PAYMENT BONDS - Supplement Subparagraph 11.4.1 as follows:

a. Bond shall be equivalent to AIA Form A311, two part Performance Bond and Labor and Materials Bond with amount shown on each part equal to 100% of the total amount payable by the terms of the Contract. Surety shall be company licensed to do business at the place of building and shall be acceptable to the Owner.

END OF SECTION

LIST OF DRAWINGS

General

Cover
Survey
CFP Code Footprint
ADA ADA Diagrams
L1.1 Landscape Plan

Architectural Demolition

D1.1 Site Demolition Plan
D1.2 Photographs
D2.1 First Floor & Basement Demolition Plans
D2.2 Second & Third Floor Demolition Plans
D2.3 Photographs
D2.4 Photographs
D2.5 Photographs

Architectural

A1.1 Site Plan
A1.2 Site Details
A2.1 First Floor & Basement Plans
A2.2 Second & Third Floor Plans
A3.1 Exterior Elevations
A3.2 Building Sections
A3.3 Ramp & Stair Sections
A5.1 Roof Plan
A7.1 First Floor & Basement Reflected Ceiling Plans
A7.2 Second & Third Floor Reflected Ceiling Plans
A8.1 Toilet Enlarged Plans & Interior Elevations
A8.2 Toilet Details
A9.1 Casework Elevations & Sections
A9.2 Casework Elevations & Sections
A10.1 Interior Room Finish Schedule
A10.2 Door Schedule & Details

Mechanical/Electrical

ME1.1 Basement & First Floor Demolition Plans
ME1.2 Second & Third Floor Demolition Plans

Mechanical

M1.1 Basement & First Floor HVAC Plans
M1.2 Second & Third Floor HVAC Plans
M1.3 Basement & First Floor Drain and Vent Plans
M1.4 Second & Third Floor Drain and Vent Plans
M1.5 Basement & First Floor Domestic Water Plans
M1.6 Second & Third Floor Domestic Water Plans
M6.1 Mechanical Schedules & Details
M6.2 Mechanical Schedules & Details

Electrical

E1.0 Electrical Site Plan
E1.1 Basement & First Floor Lighting Plans
E1.2 Second & Third Floor Lighting Plans
E1.3 Basement & First Floor Power Plans
E1.4 Second & Third Floor Power Plans
E1.5 Fire Alarm Plan
E6.1 Electrical Details
E6.2 Electrical Schedules

SECTION 01010

GENERAL WORK REQUIREMENTS

1. GENERAL

Should conflict occur between these General Work Requirements and the General Conditions, the requirements of this Section take precedence.

2. INTENT OF DOCUMENTS

The Contract Drawings are complementary and what is called for by anyone shall be as binding as if called by all. The intention of the documents is to include all labor and materials, equipment and transportation necessary for the proper execution of the work.

3. MANUFACTURER'S DIRECTIONS

All manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturers, unless herein specified to the contrary.

4. COOPERATION - CONTRACTOR WITH OWNER

It shall be clearly understood that the Owner reserves the right to install various equipment in the building prior to completion and acceptance, and it shall be the duty of the Contractor to cooperate with the Owner's employees rendering such assistance and so arranging his work that the entire project will be delivered complete in the best possible condition when required.

5. BUILDING PERMIT

As stated in Subparagraph 4.7.1, AIA DOCUMENT A201, General Conditions, the General Contractor shall secure and pay for the building permit.

6. CONSTRUCTION COORDINATION

A. Before starting construction, a meeting shall be held with Contractor(s), Architect, Consulting Engineers in attendance to plan and coordinate the schedule of construction and to review intent of Contract Documents. Contractor(s) shall follow instructions received at meeting in prosecuting the Work.

7. MATERIALS - EQUIPMENT - SUBSTITUTION

A. In general, these Specifications identify the required materials and equipment by naming one or more manufacturers, brand, model, catalog number and/or other identification; the first-named manufacturer's product used as a basis for design; the other named brands considered equivalent. Equivalent brand manufacturers named must furnish products consistent with the Specifications for the first-named product, as determined by the Architect. Base Bid shall include only those brands named and must be used on the project, except as hereinafter provided.

B. Materials or equipment specified exclusively, Base Bid shall be based on same and used on project, except as hereinafter provided.

C. Prior to receipt of bids, should Contractor wish to incorporate in Base Bid, brands or products other than those named in the Specifications, he shall submit written request for substitution to Architect not later than seven (7) days prior to date bids are due. Architect will consider request and items approved will be listed in an addendum issued to all bidders.

D. After execution of Contract, substitution of product brands for those named in the Specifications will be considered, only if request is received within thirty (30) days after Contract Date and request includes showing credit due Owner.

E. Materials specified equivalent and those proposed for substitution must be equal or better than first-named material in construction, efficiency, utility, aesthetic design, physical size shall not be larger than space provided for it. Request for substitution by full description and technical data in two (2) copies, including manufacturer's name, model, catalog number, photographs or cuts, physical dimensions, operating characteristics, and any other information for comparison.

F. Owner reserves the right:
   1) To require any or all bidders, before execution of Contract, to state what materials they will use.
   2) To require "if bound with the Bid Form," the Contractor to fill out a BID SUPPLEMENT listing the BASE BID and "ADD" or "DEDUCT" for other materials he proposes to use.

8. APPROVAL OF SUBCONTRACTORS – MATERIALS

A. The Contractor, if requested, must submit for approval before signing Agreement, list of Subcontractors and material suppliers enumerating items of work to be performed, name of materials, equipment, etc., to be furnished and/or installed. Refer to Paragraph - MATERIALS - EQUIPMENT - SUBSTITUTION.

B. If the list is not requested prior to signing of Agreement, list, as described in previous paragraph, shall be furnished within ten (10) days of signing Agreement.

9. PROTECTION - Supplement, ARTICLE 10, AIA GENERAL CONDITIONS

A. Refer to Paragraph - WEATHER CONDITIONS.

B. Each Contractor shall assume responsibility for his materials stored on the premises.

C. General Contractor shall take charge and assume general responsibility for proper protection of project during construction.

D. The General Contractor shall protect trees, shrubs, lawns and all landscape from damage, providing guards and covering. Damaged work shall be repaired or replaced at his expense. Protect streets and sidewalks and make repairs at his expense.
   1) Water Protection. The General Contractor shall, at all times, protect the excavation, trenches, and/or the building from damage by rain water, spring water, ground water, backing up of drains or sewers and all other water. He shall provide all pumps and equipment and enclosures to provide this protection.

   2) Temporary Drainage. The General Contractor shall construct and maintain all necessary temporary drainage and do all pumping necessary to keep the excavation free of water.

   3) Snow and Ice. The General Contractor shall remove all snow and ice from public sidewalks and from the building, as may be required for the proper protection and/or prosecution of the Work.

   4) Bracing, Shoring and Sheeting. The General Contractor shall provide all shoring, bracing and sheeting as required for safety and for the proper execution of the work and have same removed when the work is completed.

   5) Guard Lights. The General Contractor shall provide and maintain guard lights at all barricades, railings, obstructions in the streets, roads or sidewalks and at all trenches or pits adjacent to public walks or roads.

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

10. WEATHER CONDITIONS

The Contractor shall protect all portions of his work and all materials, at all times from damage by water, freezing, frost and is to repair, replace and make good to the satisfaction of the Architect, any portion of same which may in the Architect's opinion, have been damaged by the elements.

11. GRADES, LINES, LEVELS, AND SURVEYS

The Owner will establish the lot lines, restrictions and a bench mark. All other grades, lines, levels, and bench marks shall be established and maintained by the General Contractor, who shall be responsible for same. The General Contractor shall verify all grades, lines, levels and dimensions as shown on the Drawings and he shall report all errors or inconsistencies in the above to the Architect before commencing work.

A. The General Contractor shall provide and maintain well-built batter boards at all corners. He shall establish bench marks in not less than two (2) widely separated places. As the work progresses, he shall establish bench marks at each floor, giving exact levels of the various floors.

B. As the work progresses, the General Contractor shall lay out in the forms and the rough flooring the exact location of all partitions as a guide to all trades.

C. The General Contractor shall verify all grades, lines, levels and dimensions as shown on the Drawings and he shall report any errors or inconsistencies in the above to the Architect before commencing work.

12. USE OF COMPLETED PORTIONS

The Owner reserves the right to take possession of and use any completed or partially completed portions of the building, and further reserves the right to install equipment and facilities which are not a part of the Contract, notwithstanding the fact that the time of completion of entire work or portions thereof may not have expired; but such taking possession or installation of facilities shall not be deemed an acceptance of any work not completed in accordance with the Contract Documents. The Owner, in taking possession of completed portions or installing such equipment, and facilities, shall do so at his own expense any damage which may occur either directly or indirectly by reason of such action.

A. Building Completion-Occupancy. Owner reserves the right to occupy building when the time for completion of work as stipulated in Contract has been reached, even though all parts of the work have not been completed and accepted by Owner. All work, including heating, electrical, and water service, will be discontinued only to Owner schedule.

B. Limit of Contract is not confined to any particular area of the site, but includes any area required to perform work shown on the Drawings and/or specified in these Specifications.

13. REQUIREMENTS IMMEDIATELY AFTER EXECUTION OF CONTRACT

Immediately after execution of the Contract, the Contractor shall deliver to the Architect the following items which are described more fully in following Articles:

Schedule of Values
Schedule of Operations
Progress Charts
Samples
Superintendent's name and resume of experience
List of Subcontractors and Material Suppliers

A. Schedule of Values on AIA Form G702, or other form approved by the Architect, a detailed breakdown of the Contract Sum indicating the amounts allotted to the various divisions of the work for labor and material. The schedule will serve as a guide to the Architect in determining the amounts due each month as the work progresses. The schedule shall be broken down as directed by the Architect.

B. Schedule of Operations based on the above Schedule of Values and indicating the progress of the work up to the first day of each month shall be prepared by the Contractor in a form approved by the Architect and shall be delivered to the Architect in duplicate with each application for payment.

C. Progress Charts based on the above specified schedule of operations and indicating the progress of the work up to the first day of each month shall be prepared by the Contractor in a form approved by the Architect and shall be delivered to the Architect in duplicate with each application for payment. Progress charts shall be in the form of a bar graph.

14. CONSTRUCTION PROCEDURE AND PHASING

A. Each Contractor shall schedule his work so as to cause a minimum of interference with business operations during all of the construction work.

B. In-Use Areas. Construction work within areas immediately adjacent to existing in-use areas shall be coordinated with the Owner, so that work is accomplished during periods of light occupancy of the areas and cause the least disturbance. Work in and adjacent to in-use areas shall be prosecuted by methods that will create the last amount of noise. Work shall be prefabricated away from office areas when practical to do so. New facilities shall be ready for use prior to disturbing existing areas.

C. Precautions and Cooperation

1) Notify the Owner 7 days in advance before any utility (natural gas, water, electricity, or sewer) is to be interrupted.

2) With proper notification, interruption in utilities up to 4 hours will be permitted without special provisions by the Contractor. *If any interruption of a utility exceeds 4 hours the Contractor must make arrangements for temporary alternate utility service.

3) Interruption of utilities must be coordinated with the Owner with changeovers and out of service at night. Weekend and evening changeovers of utilities shall occur with no additional cost to the Owner.

4) Openings to be cut in existing exterior walls must be saw cut. No jackhammer work will be permitted. Notify the Owner 7 days in advance of cutting of exterior walls.

15. TIME EXTENSIONS ADVERSE WEATHER

A. The Contractor shall comply with all provisions of the General Conditions in submitting any request for extension of Contract Time due to unusually severe weather.

B. Definitions:

1. Adverse Weather - Atmospheric conditions at a definite time and place which are unfavorable to construction activities.

2. Unusually Severe Weather - Weather which is more severe than the adverse weather anticipated for the season, location, or activity involved.

C. In order for any request of time extension due to unusually severe weather to be valid, the Contractor must document both of the following conditions.

1. The weather experienced at the project site during the Contract period is more severe that the adverse weather anticipated for the project location during any given month.

2. The unusually severe weather actually caused a delay to the completion of the project. The delay must be beyond the control and without fault or negligence by the Contractor.

D. The following schedule of monthly anticipated adverse weather delays will constitute the baseline for monthly weather time evaluations. The Contractor's Progress Schedule must reflect these anticipated adverse weather delays in all weather affected activities:
MONTHLY ANTICIPATED ADVERSE WEATHER DELAY WORK DAYS BASED ON FIVE (5) DAY WORK WEEK.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	4	7	8	10	9	8	8	7	5	4	4

END OF SECTION 01010

SECTION 01019

SPECIAL PROVISIONS

1. GENERAL

Should conflict occur between these Special Provisions and the General Conditions, the requirements of the Special Provisions shall take precedence.

2. TIME OF CONSTRUCTION – PENALTY CLAUSE

a. Time of Construction - The Contractor will commence the work within ten (10) days after the Architect shall have given the Contractor written notice to commence construction to the satisfaction of the Owner within the calendar days as stated on the Bid Form (**completion date July 1, 2019**). The time for completion herein set forth shall be extended for the period of any reasonable delay which is due exclusively to causes beyond the control and without the fault of the Contractor, including acts of God, fires, floods, and direction by the Architect. It is impractical to perform any operation of construction and acts of omissions of the Owner with respect to matters for which Owner is solely responsible; provided, however, that no such extension of time for completion shall be granted the Contractor, unless within ten (10) days after the happening of any event relied upon by the Contractor for such extension of time, the Contractor shall have made a request, therefore, in writing to the Architect. Extended time will be submitted with pay request for Owner's approval.

b. Penalty Clause - The time of completion of the construction of the project is of the essence of this Contract. Should the Contractor neglect, refuse, or fail to complete the project (100%) within the time herein agreed upon, after giving effect to extensions of time, if any, herein provided; the Owner shall have the right to deduct from and retain out of such money, which may then be due or which may become due and payable to the Contractor, the sum of THREE HUNDRED DOLLARS ($300.00) per day for each and every day that such construction is delayed in its completion beyond the specified time. If the amount due and to become due from the Contractor to the Owner is insufficient to pay in full any such liquidated damages, the Contractor shall pay to the Owner the amount necessary to effect such payment in full; provided, however, that the Owner shall promptly notify the Contractor in writing of the manner in which the amount retained, deducted or claimed. No award is given to the Contractor for early completion.

c. Joint Responsibility - The General Contractor and/or Subcontractors causing the delay in completion of the project shall be responsible for payment of the penalty. In no case shall the total penalty for all contracts exceed the sum of daily penalty multiplied by the number of days of delay in completion.

3. ALTERNATES - Refer to Alternate Schedule, Section 01030

a. Alternates specified are not a part of Base Bid, but are Alternates to same, their acceptance being at option of Owner.

4. CASH ALLOWANCES

a. Costs included in Allowances: Cost of Product to Contractor or Subcontractor, less applicable trade discounts, delivery to site, except those taxes saved by use of Owner's tax exemption.

b. Costs Not Included in the Allowance: Fees for overhead and profit, product handling at the site, including unloading, uncrating, and storage; protection of Products from elements and from damage and labor for installation and finishing.

c. Architect Responsibilities:
   1. Consult with Contractor in consideration and selection of Products, suppliers and installers.
   2. Select Products in consultation with Owner and transmit decision to Contractor.
   3. Prepare Proposal Requests and Change Orders.

d. Contractor Responsibilities:
   1. Assist Architect/Engineer in selection of Products, suppliers and installers.
   2. Obtain proposals from suppliers and installers and offer recommendations.
   3. On notification of selection by Architect, execute purchase agreement with designated supplier and installer.
   4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
   5. Promptly inspect Products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.
   6. Product handling at the site, including unloading, uncrating and storage, protection of Products

from elements and from damage and labor for installation and finishing.

7. The Contractor shall include in his Bid all fees for all cash allowances.

e. Funds will be drawn from Cash Allowances only by written authorization from Owner.

f. Cash Allowances – **Base Bid**:

1. Section 08710 Door Hardware. Note this allowance is to include hardware for doors and frames, excluding aluminum storefront. Amount $40,000.00.
2. Section 09688 Carpet. Amount $32.00 per square yard.
3. Section 10850 Building Specialties – Interior Signage. Amount of $2,000.00
4. Elevator Repair Allowance – In addition to the specification sections listed above, include an allowance of $10,000.00 in the general bid and contract amount to be included in the contractors base bid. This allowance shall be used at the sole discretion of the Architect and/or Owner specifically for required repair and upgrades to the existing passenger elevator and associated equipment.
5. Contingency Allowance – In addition to the specification sections listed above, include an allowance of $20,000.00 in the general bid and contract amount to be included in the contractors base bid. This allowance shall be used at the sole discretion of the Architect and/or Owner specifically for hidden conditions discovered in the field or on site, the addition of labor, parts and/or materials required for timely completion in conjunction with the general scope of work.

5. ENUMERATION OF DRAWINGS AND SPECIFICATIONS

a. Correlation. Accompanying these Specifications are the Drawings, which jointly with these Specifications, are intended to explain each other and describe and coordinate the work to be performed under the Contract.

b. Verification of Documents. Before submitting his bid, each Bidder shall check his set(s) of Drawings and Specifications and advise the Architect if any sheets are missing.

c. Specifications Explanations. For convenience of reference, the Specifications are separated into Titled Divisions and Sections. Such separation shall not, however, operate to make the Architect an arbiter to establish limits between the Contractor and Subcontractor or Sub-Subcontractor.

d. Drawings. Refer to LIST OF DRAWINGS.

e. Specifications. Refer to TABLE OF CONTENTS.

6. WARRANTIES

Before being eligible for final payment, Contractor shall deliver to Owner, through Architect, all special warranties specified for materials, equipment and installation.

7. OPERATING INSTRUCTIONS

Before being eligible for final payment, Contractor shall deliver to Owner, through Architect, one (1) cd of manufacturer's operating instructions and shop drawings on each piece of equipment.

8. AS-BUILT DRAWINGS

Before being eligible for final payment, the Electrical and Mechanical Contractors shall prepare and deliver to Owner, through Architect, one (1) set of AS-BUILT DRAWINGS. These drawings may consist of marked-up prints, if the Contractor so chooses, but shall show the correct location of every item of equipment, piping, conduit, panel boards, ductwork, switches, valves, etc. If marked-up prints are used, they shall be new white prints.

9. CERTIFICATE OF COMPLIANCE

Upon completion of project, Contractor is to furnish written Certification to the Architect that he has complied with every paragraph of the Specifications and Drawings.

10. CONTRACTOR'S AFFIDAVIT OF RELEASE OF LIENS

Upon completion of project, Contractor shall submit to Owner a signed Contractor's Affidavit of Release of Liens prior to final payment.

11. CONTRACTOR'S MONTHLY APPLICATION FOR PAYMENT FORM
Contractor's monthly Application for Payment shall be submitted as per General Conditions. AIA Document G702, Application and Certificate for Payment is approved and acceptable.

12. FILING AND RECORDING OF BONDS
In addition to furnishing the number of combination Performance Bond and Labor and Materials Payment Bond, and Statutory Bond, if required, the Contractor shall file copies of such bonds with Clerk of the District Court and furnish Architect with receipt furnished by Clerk of the District Court, covering charges for filing and recording of said bonds.

13. DOCUMENTS FURNISHED CONTRACTORS
The General Contractor will be furnished, free of charge, the following working drawings and specifications, including modifications for construction of the project - 10 sets. The General Contractor will be responsible for distribution of these sets to the Subcontractors and suppliers. The Contractor shall pay the actual cost of reproduction and postage for all additional sets requested by him.

14. SALES TAX EXEMPTIONS
a. Materials and equipment incorporated into this project **are not exempt** from the payment of sales tax under the laws of the State of Kansas and such sales tax **shall be included in the Bid of the Bidder**.

END OF SECTION 01019

CONTRACTOR'S REQUEST FOR INFORMATION

TO:

REQUEST FOR INFORMATION NO. _____
REQUESTED BY: _____
RESPONSE REQUIRED BY: _____

RE:

SPECIFICATION REFERENCE: _____
DRAWING REFERENCE: _____

SUBJECT: DISCREPANCY: _____ CLARIFICATION: _____ OTHER: _____

REQUEST:

_____
_____
_____
_____
_____
_____
_____
_____
_____

SIGNED: _____ DATE: _____

ARCHITECT'S RESPONSE: This information is provided as an interpretation of the Contract Documents for implementation. It shall not be authorization for change to the Contract Sum or the Contract Completion Time. Should this information result in a claim for a change in the Contract Sum or Contract Completion Time, the Contractor shall notify the Architect within twenty (20) calendar days of receipt.

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Response Distribution
Original - Contractor

SIGNED: _____ DATE: _____

SUBSTITUTION REQUEST FORM

ONE ITEM PER FORM
FILL IN ALL BLANKS

Project: _____ Date: _____

We hereby submit for your review the following substitution for the following specified material for the above project:

Section	Page	Paragraph	Specified Material

PROPOSED SUBSTITUTION: _____
Attach complete technical data, including laboratory tests, if applicable. Include complete information on changes to Drawings and/or Specifications which proposed substitution will require for its proper installation.

A. Does the Substitution effect dimensions shown on Drawings in any way?

_____

B. Will the undersigned pay for any changes to the building design, including engineering and detailing costs caused by the requested substitution?

_____

C. What effect does substitution have on schedule or other trades?

_____

D. What effect does substitution have on cost?

_____

E. Differences between proposed substitution and specified items are:
_____ Same _____ Different (Explain)

_____

F. Contractor represents that he has investigated the proposed product and determined that it meets or exceeds the quality of the specified product.

SUBMITTED BY:

_____ Accepted _____Accepted as Noted
_____ Not Accepted _____ Received Too Late

_____
(Firm)

_____ _____ _____
(Address) (By) (Date)

_____ _____
(Telephone) (Remarks)

_____ _____
(Signature)

FINAL LIEN WAIVER AND RELEASE

Reference that certain Agreement between _____, as Contractor, and _____ as Owner, dated _____, on the project known as _____ located at _____for work to be performed by said Contractor.

Reference also that certain invoice of Contractor to said Owner in the Amount of $_____ for work, labor and materials installed in or furnished for said project by and through _____.

The receipt by Contractor of Owner's remittance for the amount said invoice, contingent upon the final clearance and payment of said remittance, shall constitute payment for the full contract amount, including change orders and all other claims or demands of any nature whatsoever which Contractor has or may have in connection with the Project or Contract referenced herein, of $_____, for which Contractor (a) agrees to and does hereby waive and release said property, project and the Owner and all bond or payment sureties and guarantors from; and (b) does hereby agree to protect, indemnify, defend and hold harmless said property, project, Owner, sureties and guarantors against;

(1) any and all liens, statutory or otherwise, and

(2) any or all obligations under any bond or guaranty for payment furnished by or to said Owner, whether pursuant to agreement or requirement of law, and

(3) any and all other claims whatsoever, statutory or otherwise,

for any and all work, labor and materials furnished by or through said Contractor, its subcontractors and material suppliers for the entirety of said project.

The remittance of the Owner, identified as payment of said above invoice and endorsed by Contractor and marked "paid" or otherwise canceled by the bank against which said remittance was drawn shall constitute conclusive proof that said invoice was paid and the payment thereof was received by the Contractor, and thereupon, this final lien waiver shall become effective automatically and without requirement of any further act, acknowledgment or receipt of the part of said Contractor.

Contractor does further warrant that Contractor has not and will not assign its claims for payment nor its right to perfect a lien against said property and project, and the undersigned representative of the contractor has the right to execute this waiver and release thereof.

The undersigned representative of Contractor does hereby certify under oath that he is fully authorized and empowered to execute this instrument for and in behalf of said Contractor and to bind them hereto and does in fact so execute this final lien release.

Dated this _____ day of _____, 20____.

Contractor: _____

By: _____

Title: _____

Subscribed and affirmed to before me, the undersigned Notary Public within and for the State of _____ and the County of _____, this _____ day of_____, 20____, in the City of _____.

_____
Notary Public within and for said County and State

SECTION 01030

ALTERNATES

A. GENERAL

a. The General Contractor shall state in his Bid Form the amount of dollars to be ADDED or DEDUCTED from his Base Bid for the following Alternates.

b. Alternates are not in order of acceptance.

c. It shall be the responsibility of the General Contractor to advise all necessary personnel and suppliers as to the nature and extent of all Alternates selected by the Owner.

1. ALTERNATE NO. 1

The Contractor shall state the amount of dollars to be add to the Base Bid for all work, labor and materials, associated with the removal of existing asphalt pavement and installation of new asphalt paved parking lot of approximate 10,110 s.f. (note, this area includes only the existing parking area surface, not entirety of parking area). Price shall include removal of existing asphalt and associated grade. Also include crushed concrete base and all associated prep work.

Add $ _____

2. ALTERNATE NO. 2

The Contractor shall state the amount of dollars to be add to the Base Bid for all work, labor and materials, associated with the removal of existing west main entry metal fascia panel/framing and installation of new fascia.

.

Add $ _____

3. ALTERNATE NO. 3

The Contractor shall state the amount of dollars to be add to the Base Bid for all work, labor and materials, associated with the replacement of existing wood doors off of the main hallway at Second and Third Floors. Existing wood frames to remain. Do not include Doors #229, #252, #301, #306, #316, #337 as they are already to be replaced per Base Bid.

Add $ _____

4. ALTERNATE NO. 4

The Contractor shall state the amount of dollars to be add to the Base Bid for all work, labor and materials, associated with the replacement of all existing window units on the Third Floor. Eighteen window units total. Units will be aluminum insulated sliding glass units with integral blinds. Credit back the replacement of broken glass in identified units.

Add $ _____

5. ALTERNATE NO. 5

(If added by Addendum)

Add or Deduct $ _____

END OF SECTION 01030

SECTION 01310
PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. Coordination Drawings.
   2. Administrative and supervisory personnel.
   3. Project meetings.
   4. Requests for Interpretation (RFIs).

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

1.3 DEFINITIONS

A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.4 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections that depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.
   4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

C. 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.

D. 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.
   8. Startup and adjustment of systems.
   9. Project closeout activities.

E. 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. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.5 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. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
      a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
      b. Indicate required installation sequences.
      c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1.6 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1.7 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 **three** days of the meeting.

B. Preconstruction Conference (**By Architect**): Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than **15** days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
   1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   2. Agenda: Discuss items of significance that could affect progress, including the following:
      a. Tentative construction schedule.
      b. Phasing.
      c. Critical work sequencing and long-lead items.
      d. Designation of key personnel and their duties.
      e. Procedures for processing field decisions and Change Orders.
      f. Procedures for RFIs.
      g. Procedures for and inspecting.
      h. Procedures for processing Applications for Payment.
      i. Distribution of the Contract Documents.
      j. Submittal procedures.
      k. LEED requirements.
      l. Preparation of Record Documents.
      m. Use of the premises and existing building.
      n. Work restrictions.
      o. Owner's occupancy requirements.
      p. Responsibility for temporary facilities and controls.
      q. Construction waste management and recycling.
      r. Parking availability.
      s. Office, work, and storage areas.

t. Equipment deliveries and priorities.
u. First aid.
v. Security.
w. Progress cleaning.
x. Working hours.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
a. The Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts.
j. Compatibility problems.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written recommendations.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings (**By Architect**): Conduct progress meetings at **monthly** intervals. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Owner, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:
   1) Interface requirements.
   2) Sequence of operations.
   3) Status of submittals.
   4) Deliveries.
   5) Off-site fabrication.
   6) Access.
   7) Site utilization.
   8) Temporary facilities and controls.
   9) Work hours.
   10) Hazards and risks.
   11) Progress cleaning.
   12) Quality and work standards.
   13) Status of correction of deficient items.
   14) Field observations.
   15) RFIs.
   16) Status of proposal requests.
   17) Pending changes.
   18) Status of Change Orders.
   19) Pending claims and disputes.
   20) Documentation of information for payment requests.

3. Minutes: Contractor shall record the meeting minutes.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
   a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

E. 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: In addition to representatives each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of 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 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: Contractor shall record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.8 REQUESTS FOR INTERPRETATION (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.

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. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow **seven** working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.
   1. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
   2. 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 1 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 **7** days of receipt of the RFI response.

D. 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.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly:
   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.
   9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01310

SECTION 01330

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.4 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 Division 1 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. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
   1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
   2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
   3. Resubmittal Review: Allow 15 days for review of each resubmittal.
   4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 15 days for initial review of each submittal.
   5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

D. Identification: Place a permanent label or title block on each submittal for identification.
   1. Indicate name of firm or entity that prepared each submittal on label or title block.

2. Provide a space approximately on label or beside title block to record Contractor's review and approval markings and action taken by Architect
3. Include the following information on label for processing and recording action taken:
    a. Project name.
    b. Date.
    c. Name and address of Architect.
    d. Name and address of Contractor.
    e. Name and address of subcontractor.
    f. Name and address of supplier.
    g. Name of manufacturer.
    h. Submittal number or other unique identifier, including revision identifier.
    i. Number and title of appropriate Specification Section.
    j. Drawing number and detail references, as appropriate.
    k. Location(s) where product is to be installed, as appropriate.
    l. Other necessary identification.

E. Deviations: Highlight or otherwise specifically 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 in 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**,** received from sources other than Contractor.
1. Transmittal Form: Use General Contractor’s standard transmittal form
2. Transmittal Form: Provide locations on form for the following information:
    a. Project name.
    b. Date.
    c. Destination (To:).
    d. Source (From:).
    e. Names of subcontractor, manufacturer, and supplier.
    f. Category and type of submittal.
    g. Submittal purpose and description.
    h. Specification Section number and title.
    i. Drawing number and detail references, as appropriate.
    j. Transmittal number**,** numbered consecutively.
    k. Submittal and transmittal distribution record.
    l. Remarks.
    m. Signature of transmitter.
3. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with Architect’s and/or Consultant/s stamp indicating approval action.

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Use only final submittals with mark indicating review and approval by Architect and/or Consultant.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

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. Standard color charts.
      e. Manufacturer's catalog cuts.
      f. Wiring diagrams showing factory-installed wiring.
      g. Printed performance curves.
      h. Operational range diagrams.
      i. Mill reports.
      j. Standard product operation and maintenance manuals.
      k. Compliance with specified referenced standards.
      l. Testing by recognized testing agency.
      m. Application of testing agency labels and seals.
      n. Notation of coordination requirements.
   4. Submit Product Data before or concurrent with Samples.
   5. Number of Copies: **Submit one (1) electronic copy of Product Data, unless otherwise indicated.**

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: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
      a. Dimensions.
      b. Identification of products.
      c. Fabrication and installation drawings.
      d. Roughing-in and setting diagrams.
      e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
      f. Shopwork manufacturing instructions.
      g. Templates and patterns.
      h. Schedules.
      i. Design calculations.
      j. Compliance with specified standards.
      k. Notation of coordination requirements.
      l. Notation of dimensions established by field measurement.
      m. Relationship to adjoining construction clearly indicated.
      n. Seal and signature of professional engineer if specified.
      o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
   2. Sheet Size (**For O&M Manuals Only**): 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 40 inches.
   3. Number of Copies: **Submit one (1) electronic copy of each submittal.** Submit additional printed copies where copies are required for operation and maintenance manuals.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.

2. Identification: Attach label on unexposed side of Samples that includes the following:
   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

4. 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. Number of Samples: Submit two full set(s) 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.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
   a. Number of Samples: Submit two sets of Samples. Architect will retain one Sample set.
      1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product.
2. Number and name of room or space.
3. Location within room or space.
4. Number of Copies: Submit three copies of product schedule or list, unless otherwise indicated.

F. Contractor's Construction Schedule: Comply with requirements specified in Division 1.

G. Submittals Schedule: Comply with requirements specified in Division 1.

H. Application for Payment: Comply with requirements specified in Division 1.

I. Schedule of Values: Comply with requirements specified in Division 1.

J. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information
1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.
4. Number of Copies: Submit two copies of subcontractor list, unless otherwise indicated.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.
   1. Number of Copies: Submit two 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 specified in Division 1

B. Coordination Drawings: Comply with requirements specified in Division 1.

C. Contractor's Construction Schedule: Comply with requirements specified in Division 1.

D. 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.

E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

I. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

J. 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 in the Contract Documents.

K. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. 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. Include the following information:
   1. Name of evaluation organization.
   2. Date of evaluation.
   3. Time period when report is in effect.
   4. Product and manufacturers' names.
   5. Description of product.
   6. Test procedures and results.
   7. Limitations of use.

M. Schedule of Tests and Inspections: Comply with requirements specified in Division 1.

N. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

O. 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.

P. 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 in the Contract Documents.

Q. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 1.

R. 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.

S. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
   1. Preparation of substrates.
   2. Required substrate tolerances.
   3. Sequence of installation or erection.
   4. Required installation tolerances.
   5. Required adjustments.
   6. Recommendations for cleaning and protection.

T. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
   1. Name, address, and telephone number of factory-authorized service representative making report.
   2. Statement on condition of substrates and their acceptability for installation of product.
   3. Statement that products at Project site comply with requirements.
   4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
   5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   6. Statement whether conditions, products, and installation will affect warranty.
   7. Other required items indicated in individual Specification Sections.

U. 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.

V. Construction Photographs and Videotapes: Comply with requirements specified in Division 1.

W. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect.

2.3 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
   1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
   1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and 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. Architect will forward each submittal to appropriate party.

D. Partial submittals are not acceptable, will be considered non-responsive, and will be returned without review.

END OF SECTION 01330

SECTION 01500

TEMPORARY FACILITIES

1. GENERAL

Should conflict occur between the Temporary Facilities and the General Conditions, the requirements of this Section take precedence.

2. TEMPORARY HEAT

a. The General Contractor shall provide heat, fuel and services as necessary to protect all work and materials against injury from dampness and cold until final acceptance of all work and material in the Contract, unless the building or buildings are fully occupied by the Owner prior to such acceptance, in which case, the Owner shall assume all expenses of heating from date of occupancy. The General Contractor shall provide heat as follows:

1) At all times during the placing, setting and curing of concrete, provide sufficient heat to insure the heating of the spaces involved to not less than 50° F.
2) From the beginning of the application of gypsum board taping and during the setting and curing period, provide sufficient heat to produce a temperature in the spaces involved of not less than 50° F.
3) For a period of ten (10) days previous to the placing of interior wood finish and throughout the placing of this and other interior finishing, varnishing, painting, etc., and until final acceptance of the work or until full occupancy by the Owner, provide sufficient heat to produce a temperature of not less than 70° F. Heating Subcontractor shall set such necessary temporary radiation as may be required.
4) Mechanical Subcontractor is responsible to provide temporary heating.
5) Permanent HVAC System: If Owner authorizes use of permanent HVAC system(s) prior to substantial completion; provide filters at air grilles in system. Before Substantial Completion, all units and ductwork shall be thoroughly cleaned and restored to original or new condition. Manufacturer's warranties on new equipment will not begin until substantial completion and cleaning of units and duct work has been performed.

3. TEMPORARY FIELD OFFICES (CONTRACTORS OPTION)

a. General Contractor shall provide and maintain in good condition, a painted weatherproof field office (adequate size trailer acceptable) for use of General Contractor and Architect's representative. Provide such building with heat, electric lights, telephone, locked doors, windows, table, and rack for Drawings. Building to remain property of General Contractor.
b. Electrical and Mechanical Subcontractors shall maintain similar field office as needed, meeting requirements of previous paragraph, except provisions for Architect's representative not needed.

4. TEMPORARY ENCLOSURES

General Contractor to provide:
a. Temporary weathertight enclosures for all exterior openings as soon as possible as walls and roofs are built to protect work from weather. Temporary exterior doors equipped with padlocks.
b. In cold weather, provide additional precautions necessary, including heat at such openings to protect building and contents.

5. TEMPORARY STORAGE

a. The Contractor shall provide and maintain on the premises watertight storage enclosures for storage of all materials which may be damaged by weather. These enclosures shall have floors raised above the ground.

6. TEMPORARY CONSTRUCTION ITEMS

a. General Contractor shall furnish necessary temporary stairs, chutes, runways, scaffolds, ladders and hoist.

7. TOILET ACCOMMODATIONS

a. The General Contractor shall provide for the use of all workmen, in accordance with local ordinances, ample temporary sanitary toilet accommodations and keep such clean and free from flies. Prior to completion of the Contract, all connections and appliances connected with same will be removed and the premises left perfectly clean.

8. TEMPORARY TELEPHONE

a. The General Contractor shall install at his own expense, a job telephone, and shall pay for all local calls. All long distance calls shall be paid by party making the call.

9. TEMPORARY LIGHT, POWER, AND GAS

a. General Contractor shall arrange for temporary service, pay for all expenses therewith and bring services to building and run extensions to locations necessary for operations.
b. Permit other Subcontractors to use same. Other Subcontractors requiring additional extensions, make and remove same at their expense.
c. Owner shall pay for all electricity and gas consumed.

10. WATER FOR CONSTRUCTION

a. The Contractor shall be responsible to provide water for construction until the permanent water service is re-established. Upon the water service being complete, Owner will pay for all water consumed.

11. CONSTRUCTION DUST PARTITIONS

a. Contractor shall provide dust-proof partitions separating areas of completed construction from non-completed construction.

END OF SECTION 01500

SECTION 01700
PROJECT CLOSEOUT

PART 1 GENERAL

1.01 SECTION INCLUDES:

A. Related Documents

B. Summary

C. Completion of a Building and/or Phase

D. Final Completion and Final Payment

E. Record Document Submittals

F. Starting Systems

G. Operating and Maintenance Instructions

H. Final Cleaning

1.02 RELATED DOCUMENTS

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

1.03 SUMMARY

A. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:
   1. Inspection procedures.
   2. Project record document submittal.
   3. Operating and maintenance manual submittal.
   4. Submittal of warranties.
   5. Final cleaning.
   6. Record vellum drawings.

B. Closeout requirements for specific construction activities are include in the appropriate Sections in Divisions 2 through 33.

1.04 SUBSTANTIAL COMPLETION

A. Substantial completion
   1. The Contractor and each Subcontractor shall carefully and regularly check their work for conformance with the Contract Documents as the work is being done. Unsatisfactory work shall be corrected as the work progresses and not be permitted to remain and become a part of the Punch List.

   2. The Contractor shall conduct a pre-punch list inspection. The written pre-punch list shall be distributed to affected subcontractors, Architect and Owner's Representative. The Contractor shall advise the Architect in writing upon completion of the pre-punch list. This notification shall so serve to notify the Architect that the Work is ready for the punch list inspection.

   3. The Architect shall make arrangements for his Punch List Inspection at the earliest possible date following Contractor notification of completion of the pre-punch list. Transmittal of the Punch List to the Contractor shall set the date for a Reinspection prior to issuance of a Certificate of Substantial Completion. Upon receipt of the Punch List, the Contractor shall within seven (7) days bring to the attention of the Architect in writing any questions that he or any of his Subcontractors may have concerning the requirements of the Punch List.

   4. When advised by the Contractor that the Punch List items have been completed, the Architect shall conduct a Reinspection with the Contractor, any needed Subcontractors (and the Owner's Representative where applicable) to determine whether the Certificate of Substantial Completion can be issued. A Certificate of Substantial Completion will only be issued after Codes Administration authorities document final approval of the building or phase.

If the first reinspection requested by the contractor and performed by the architect/engineer determines that punch list items remain incomplete, and the outstanding items have not been previously questioned by the contractor as required in Paragraph 3. above, then, all subsequent reinspections by the architect will be paid for by the Contractor.

5. When issued, the Certificate of Substantial Completion shall name the date, triggering the beginning of the warranty period (with any items to have a later starting date specifically noted). The Certificate shall also have attached to it the uncompleted Punch List items, and shall name the date for their Final Completion. The Certificate of Substantial Completion shall also state the responsibilities of the Owner and the Contractor for maintenance, heat, utilities, insurance and building security.

6. Acknowledgment of the Date of Substantial Completion by the signature of all parties on the Certificate implies possession of the premises by the Owner, and completion of incomplete Punch List items by the Contractor and the Subcontractors, at the Owner's convenience. The Owner shall cooperate in permitting the Contractor access to the work for the completion of Punch List items.

7. A Certificate of Substantial Completion for the Work, or portion of Work, as applicable, will only be issued after the requirements for the demonstration and instruction of operation and maintenance procedures as defined elsewhere by the Contract Documents, to the Owner's personnel have been satisfied by the Contractor.

B. Final Completion
1. Submit executed warranties, workmanship bonds, maintenance agreements, inspection certificates and similar required documentation for specific units of work, enabling Owner's unrestricted occupancy and use.
2. Submit maintenance manuals, tools, keys, spare parts, extra stock materials.
3. Complete instruction of Owner's operating personnel with start-up of all systems.
4. Complete final cleaning and remove temporary facilities.
(Final cleaning - at closeout time of each building, clean, reclean entire work to normal level for "first class" maintenance/cleaning of building projects of a similar nature. Remove non-permanent protection and labels, polish glass, clean exposed finishes, touch-up minor finish damage, clean or replace filters of mechanical systems, remove debris and broom clean non-occupied spaces, sanitize plumbing/food service facilities, clean light fixtures and replace burned-out/dimmed lamps, sweep and wash paved areas, police yards and grounds, and perform similar cleanup operations needed to produce a "clean" condition as judged by Architect/Engineer.)
5. All punch list work must be completed, reviewed and accepted by the Architect/Engineer.

1.05 FINAL COMPLETION AND FINAL PAYMENT

A. Provide submittals to Architect that are required by governing or other authorities. Confirm that all submittals required by the construction documents have been transmitted.

B. Final Completion: For the purpose of determining a date at which the project is finished, Final Completion may be defined to include, but is not limited to:
1. Substantial Completion.
2. Submission and acceptance by the Architect of Project Record Drawings.
3. Operation and Maintenance Data (including all air and water balance reports).
4. All applicable Owner training sessions with meeting notes distributed (video tapes, if applicable).
5. Final cleaning.
6. Adjusting (hardware, HVAC, etc.).
7 Warranties submitted by General Contractor and accepted by Architect.
8. Spare parts and maintenance materials turned over to proper District personnel.
9. All punch list work completed, reviewed and accepted by the Architect.

All of the above items are as required by individual specification requirements as found in the Contract Documents. These individual requirements shall take precedence over this definition if any conflict should arise.

C. Upon written notice by the Contractor that the Reinspection Punch List items are completed, the Architect shall verify this by inspection and shall issue to the Owner a final Certificate of Payment

stating that, to the best of their knowledge, information and belief, the Work has been completed in accordance with the terms and conditions of the Contract Documents, and that the entire balance found to be due the Contractor, and noted in said final Certificate of Payment, is due and payable. The Owner shall endeavor to make payments within thirty (30) days.

1.06 RECORD DOCUMENT SUBMITTAL

A. General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Architect's reference during normal working hours.

B. Record Drawings: A set of blue- or black-line drawings of the original bidding documents will be provided by the Owner to the Contractor for the following use:

1. If the Contractor elects to vary the work from the Contract Documents, and secures prior approval from the Architect, he shall record in a neat, readable manner, all such variances on the blue-or black-line drawings furnished.

2. For plumbing; heating; ventilating, and air-conditioning; electrical and fire protection work, Record Document Drawings shall be maintained by the Contractor as the work progresses and as follows:
   a. All deviations from the sizes, locations, and from all other features of all installations showing the Contract Documents shall be recorded.
   b. In addition it shall be possible, using these Drawings, to correctly and easily locate, identify and establish sizes of piping, direction, etc., as well as all other features of work which will be concealed.
      1) Locations of underground work shall be established by dimensions to column lines or walls, by locating all turns, etc., and by properly referenced centerline or invert elevations and rates of fall.
      2) For work concealed in the building, sufficient information shall be given so it can be located with reasonable accuracy and ease. In some cases this may be by dimension, in others, it may be sufficient to illustrate the work on the drawings in relation to the spaces in the building near which it was actually installed. Architect's decision in this matter shall be final.

3. Blue- or Black-Line Record Document Drawings shall be kept up-to-date during the entire course of the work and shall be available upon request for examination by the Architect, and, when necessary, to establish clearances for other parts of the Work.

4. The following requirements apply to all Record Document Drawings:
   a. They shall be maintained at the Contractor's expense.
   b. All such Drawings shall be done carefully and neatly by a competent draftsperson and in an approved form.
   c. Additional drawings shall be provided as necessary for clarification.
   d. The Record Document Drawings (both blue- or black-line and reproducible) shall be returned to the Architect upon completion of the work and are subject to the approval of the Architect.
   e. Delete Architect title block and seal from Record Document Drawings.

C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data.

1. Legibly mark and record at each Product section description of actual Products installed, including the following:
   a. Manufacturer’s product name and product model number.
   b. Product substitutions or alternates utilized.
   c. Changes made by Addenda and Modifications.
2. Upon completion of the Work, submit record Specifications to the Architect for the Owner's records.
3. Record Project Manual shall be maintained at the Contractor's expense.
4. Record Project Manual shall be maintained in a neat, readable manner. Contract work variations shall be recorded in the correct corresponding Technical Section of the Project Manual.
5. Delete Architect seal from Record Project Manual.

D. Record Shop Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Shop Drawings as finally approved. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark drawings accurately; record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
   1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.
   2. Mark new information that is important to the Owner, but was not shown on Shop Drawings.
   3. Note related Change Order numbers where applicable.
   4. Organize record shop drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.

E. Record Product Data: maintain one copy of each Product Data submittal. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site, and from the manufacturer's installation instructions and recommendations. Give particular attention to concealed products and portions of the Work which cannot otherwise be readily discerned later by direct observation. Note related Change Orders and mark-up of record drawings and Specifications.

   1. Upon completion of mark-ups, submit complete set of record Product Data to the Architect for the Owner's records.

F. Record Documents and Shop Drawings: Contractor to supply one complete set of approved shop drawings. Legibly mark each item to record actual construction including:
   1. Measured depths of foundations in relation to fine (main) floor datum.
   2. Measured horizontal and vertical locations of underground utilities and appurtenance, referenced to permanent surface improvements.
   3. Measured locations of internal utilities and appurtenance concealed in construction, referenced to visible and accessible features of the Work.
   4. Field changes of dimension and detail.
   5. Details not on original Contract Drawings.

G. Record Sample Submitted: Immediately prior to the date or dates of Substantial Completion, the Contractor will meet at the site with the Architect and the Owner's personnel to determine which of the submitted Samples that have been
maintained during progress of the Work or to be transmitted to the Owner for record purposes. Comply with delivery to the Owner's Sample storage area.

H. Miscellaneous Record Submittal: Refer to other Specification Sections for requirements of miscellaneous record-keeping and submittal in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Architect for the Owner's records.

I. Maintenance Manuals: Organize operating and maintenance data into one (1) cd. Properly index data.

   1. Prepare cd with with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.
   2. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
   3. Contents: Prepare a Table of Contents for each volume, with each Product or system description identified.
   4. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers where they can be reached for emergency service at all times, including nights, weekends, and holidays.
   5. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
      a. Significant design criteria.
      b. List of equipment.
      c. Parts list for each component.
      d. Operating instructions.

e. Maintenance instructions for equipment and systems.
f. Maintenance instructions for special finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.
g. Emergency instructions.
h. Spare parts list.
i. Wiring diagrams.
j. Recommended "turn around" cycles.
k. Inspection procedures.

6. Part 3: Project documents and certificates, including the following:
   a. Shop drawings and product data.
   b. Air and water balance reports.
   c. Certificates.
   d. Photocopies of warranties and bonds.

7. Submit one copy of completed volumes in final form 15 days prior to final inspection. This copy will be returned after final inspection, with Architect comments. Revise content of documents as required prior to final submittal.
8. Submit final volumes revised, within ten days after final inspection.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.01 STARTING SYSTEMS

A. Coordinate schedule of start-up of various equipment and systems.

B. Notify Architect, Owner and Program Manager seven days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or other conditions which may cause damage.

D. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of responsible manufacturer's representative (Contractors' personnel) in accordance with manufacturers' instructions.

G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report in accordance with Section 01400 that equipment or system has been properly installed and is functioning correctly.

3.02 OPERATING AND MAINTENANCE INSTRUCTIONS

A. General: Arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacture's representatives. Include a detailed review of the following items:
   1. Maintenance manuals.
   2. Record documents.
   3. Spare parts and materials.
   4. Tools.
   5. Lubricants.
   6. Fuels.
   7. Identification systems.
   8. Control sequences.
   9. Hazards.
   10. Cleaning.

11. Warranties and bonds.
12. Maintenance agreements and similar continuing commitments.

B. As part of instruction for operating equipment, demonstrate the following procedures:
1. Start-up.
2. Shutdown.
3. Emergency operations.
4. Noise and vibration adjustments.
5. Safety procedures.
6. Economy and efficiency adjustments.
7. Effective energy utilization.

3.03 FINAL CLEANING

A. General: General cleaning during construction is required by the General Provisions and Covenants and included in Division 1 Section "Temporary Facilities".

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
1. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.
   a. Remove labels that are not permanent labels.
   b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
   c. Clean exposed exterior and interior hard-surfaced finished to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
   d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.

C. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

D. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or place excess materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

1. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.

END OF SECTION 01700

SECTION 01731

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

1.3 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

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.

1. Primary operational systems and equipment.
2. Air or smoke barriers.
3. Fire-suppression systems.
4. Mechanical systems piping and ducts.
5. Control systems.
6. Communication systems.
7. Electrical wiring systems.

C. Miscellaneous Elements: Do not cut and patch miscellaneous 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.

E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. 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 in-place 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 in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied 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 in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete 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.

C. 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.

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.

a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

   a. Where patching occurs in a painted surface, 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 in-place 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.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01731

SECTION 01732
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY
- A. This Section includes the following:
  1. Demolition and removal of selected portions of building or structure.
  2. Demolition and removal of selected site elements.

1.2 QUALITY ASSURANCE
- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.
- C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Standards: Comply with ANSI A10.6 and NFPA 241.

1.3 PROJECT CONDITIONS
- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- **C. Hazardous Materials: Existing asbestos containing materials have been removed.**
  1. If additional materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.
- D. Storage or sale of removed items or materials on-site is not permitted.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

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

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS
- A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
- B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
  1. Arrange to shut off indicated utilities with utility companies.
  2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
  3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
   1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
   2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
   3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
   4. Cover and protect furniture, furnishings, and equipment that have not been removed.
   5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 1 Section "Temporary Facilities and Controls."

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
   1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
   2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
   3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
   4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
   5. Maintain adequate ventilation when using cutting torches.
   6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
   7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
   8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
   9. Dispose of demolished items and materials promptly.

B. Reuse of Building Elements: Project has been designed to result in end-of-Project rates for reuse of building elements as follows. Do not demolish building elements beyond what is indicated on Drawings without Architect's approval.

C. Removed and Reinstalled Items:
   1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
   2. Protect items from damage during transport and storage.
   3. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Cut concrete at junctures with construction to remain, using power-driven saw. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete indicated for selective demolition. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum.

1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.

F. Roofing: Remove no more existing roofing than can be covered in one day by new roofing and so that building interior remains watertight and weathertight.

1. Remove existing roof membrane, flashings, copings, and roof accessories.
2. Remove existing roofing system down to substrate.

G. Air-Conditioning Equipment: Remove equipment without releasing refrigerants.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

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

END OF SECTION 01732

SECTION 02110

SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Remove surface debris.
- B. Remove asphalt paving.
- C. Remove concrete window well.
- C. Clear site of plant life and grass.
- D. Topsoil excavation.

1.02 REGULATORY REQUIREMENTS
- A. Conform to applicable local codes and ordinances for disposal of debris, burning debris on site, use of herbicides, etc.
- B. Coordinate clearing Work with utility companies as required.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 PREPARATION
- A. Verify that existing plant life designated to remain, is tagged or identified.
- B. Coordinate with owner for equipment to be removed by owner.

3.02 PROTECTION
- A. Locate, identify, and protect utilities that remain, from damage.
- B. Protect trees, plant growth, and features designated to remain, as final landscaping.
- C. Protect bench marks and existing structures from damage or displacement.

3.03 CLEARING
- A. Clear areas required for access to site and execution of Work.
- B. Remove window well as designated.

3.04 REMOVAL
- A. Remove debris, rock, and extracted plant life from site.

3.05 TOPSOIL EXCAVATION
- A. Excavate clean topsoil from areas to be further excavated, filled, re-landscaped, or regraded.
- B. Stockpile in area designated on site to depth not exceeding 8 feet. Protect from erosion. Remove excess topsoil not being reused, from site.

END OF SECTION 02110

SECTION 02205

SOIL MATERIALS

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Subsoil and topsoil materials.

1.02 REFERENCES
- A. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.
- B. ASTM D2487 - Classification of Soils for Engineering Purposes.

PART 2 PRODUCTS

2.01 SOIL MATERIALS
- A. Fill Material: Under slabs and within the zone of influence of foundation elements must be a material approved by the geotechnical engineer.
- B. Fill and Backfill Material: Other areas, foundation backfill, site grading, and pavement, should be clean site material or similar borrow material, approved by the geotechnical engineer. Foreign matter shall be limited in size to 1 ½ ” in greatest dimension, and be limited to no more than 5% by volume or weight.
- C. Topsoil: Incorporate topsoil into subsoil 3”- 4”. Topsoil should be blended and contain the following components by percentage:

Organic Matter:	4 - 6 %
Sand (ASTM - 300 and 75% between .25mm and .75mm):	40 - 50%
Silt:	20 - 25%
Clay:	25 - 40%

2.02 SOURCE QUALITY CONTROL
- A. Inspection and testing will be performed by an independent laboratory, Owner shall bear all related costs under provisions of General Requirements.
- B. Tests and analysis of soil material will be performed in accordance with ANSI/ASTM D698.
- C. If tests indicate materials do not meet specified requirements, change material and retest at no cost to Owner.

PART 3 EXECUTION

3.01 STOCKPILING
- A. Stockpile materials on site at locations indicated or in areas that will not impact project completion.
- B. Stockpile in sufficient quantities to meet project schedule and requirements.
- C. Separate differing materials with dividers or stockpile apart to prevent mixing.
- D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.02 STOCKPILE CLEANUP
- A. Remove stockpile, leave area in a clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION 02205

SECTION 02211

ROUGH GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Removal of topsoil and subsoil.
- B. Cutting, grading, filling and rough contouring the site.

PART 2 PRODUCTS

2.01 MATERIALS
- A. Topsoil, Fill and Structural Fill: As specified in Section 02205.

PART 3 EXECUTION

3.01 EXAMINATION
- A. Verify that survey bench mark and intended elevations for the Work are as indicated.

3.02 PREPARATION
- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities. Locate, identify, and protect utilities that remain, from damage. Notify utility company to remove and relocate utilities.
- C. Protect above and below grade utilities that remain.
- D. Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.
- E. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.03 SUBSOIL EXCAVATION
- A. Excavate subsoil from areas to be further excavated, relandscaped, or regraded.
- B. Stockpile in area designated on site to depth not exceeding 8 feet. Protect from erosion. Remove subsoil not being reused, from site.
- C. When excavating through roots, perform work by hand and cut roots with sharp axe.

3.04 FILLING
- A. Fill areas to contours and elevations with unfrozen materials.
- B. Place fill materials on continuous layers and compact in accordance with Schedule at end of Section.
- C. Maintain optimum moisture content of fill materials to attain required compaction density.
- D. Slope grade away from building minimum 2 inches in 10 ft. unless noted otherwise.
- E. Make grade changes gradual. Blend slope into level areas.
- F. Remove surplus fill materials from site.

3.05 TOLERANCES
- A. Top Surface of Subgrade: Plus or minus 1/10 foot.

3.06 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of the General Requirements.
B. Compaction testing will be performed in accordance with ANSI/ASTM D698.
C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no additional cost to the Owner.

3.07 SCHEDULES

A. Structural Fill: (Building and Paving)
   1. Fill Maximum 8 inches compacted depth.
   2. Compact to minimum 95 percent of maximum density Standard Proctor.
B. Subsoil Fill:
   1. Fill Maximum 8 inches compacted depth.
   2. Compact to minimum 90 percent of maximum density Standard Proctor.
C. Topsoil Fill:
   1. Fill Maximum 8 inches depth.

END OF SECTION 02211

SECTION 02220

EXCAVATION, TRENCHING AND BACKFILLING FOR UTILITIES

1.01 SCOPE OF WORK

A. This work shall include the furnishing of all labor, materials, and equipment necessary for the clearance, excavating, trenching and backfilling, the continual drainage of excavation, sheeting, bracing and shoring of sides of excavation, backfilling around structures and over pipe lines, the disposal of excess excavated materials, unsuitable materials and finish site grading of the areas disturbed by the trenching operations.

1.02 CLASSIFICATION OF EXCAVATED MATERIALS:

A. Excavated materials shall be unclassified and shall include any and all materials including water and rock encountered during the construction of the work.

1.03 BLASTING:

A. No blasting shall be permitted on this project.

1.04 TRENCH EXCAVATION:

A. The trench shall be dug to the required alignment and depth as shown on the Plans or directed by the Engineer and only so far in advance of pipe laying as the Engineer shall permit. Minimum cover on all pressure pipe shall be 42-inches, unless otherwise specified. Trench width shall be a minimum of 12-inches greater than the outside diameter of the barrel of the pipe and a maximum of 24-inches greater than the outside diameter of the barrel of the pipe. The trench shall be braced and drained when necessary to ensure safe working conditions at all times. Where water is encountered, the bracing or sheeting shall be designed and placed to drain water to a sump outside the sheeting area. No water will be permitted in the trench. Bracing and/or sheeting will be left in place until the line pipe is installed and sufficient backfill is in place so as no damage to the line pipe may result from its removal. All trenching shall provide a uniform grade which will provide full support for the entire length of pipe. Over-depth excavation and non-uniform grades shall be backfilled with suitable material and compacted to provide uniform, continuous support for the entire length of pipe.

B. Rock Excavation: Where rock is encountered, it shall be removed to a depth of at least 6-inches below grade. The amount of over-excavated material shall be replaced with either fine sand or earth which is free of stones. This backfill shall be placed and compacted by hand or a mechanical method approved by the Engineer prior to installation of line pipe.

1.05 UNAUTHORIZED TRENCH WIDTHS:

A. Where, for any reason, the width of the lower portion of the trench as excavated at any point exceeds the maximum permitted in the foregoing tables the size of pipe and depth of cover at such point, either pipe of adequate design, total concrete pipe encasement, or arch concrete encasement as required by loading conditions and as determined by the Engineer shall be furnished and installed by and at the expense of the Contractor. The determination of necessary pipe, special embedment, or arch concrete encasement shall be based on a pipe strength equal to the minimum three edge bearing ultimate strength for rigid pipe, and prism loading for flexible pipe ultimate strength stipulated in the governing pipe specifications for the size and kind of pipe involved with a safety factor of 2. Trench loadings will be based on saturated backfill weighing 120 pounds per cubic foot with suitable allowance for truck or other live loads where required.

1.06 MECHANICAL EXCAVATION:

A. The use of mechanical equipment will not be permitted in locations where its operation would cause damage to trees, buildings, culverts, or other existing property, utilities, or structures above or below ground; in all such locations, hand excavating tools and methods shall be used.

B. Mechanical equipment used for trench excavation shall be of a type, design, and construction and shall be so operated that the control of the rough trench excavation bottom elevation is accurate and positive at all times, that uniform trench widths and vertical side walls are obtained at least from an elevation one foot above the top of the installed pipe to the bottom of the trench and that the trench alignment is such that the pipe when accurately laid to specified alignment will be centered in the trench with adequate clearance between the pipe and side walls of the trench as excavated at all points. Undercutting of the sidewall to obtain such clearance will not be permitted.

C. All mechanical trenching equipment, its operating condition and the manner of its operations, shall be subject at all times to the approval of the Engineer.

1.07 DEWATERING OF TRENCHES:

A. Pipe trenches shall be kept free from water during excavation, fine grading, pipe laying and jointing, and pipe encasement operations. Where the trench bottom is mucky or otherwise unstable because of the presence of ground water, and in all cases where the static ground water elevation is above the bottom of any trench or bell hole excavation, the ground water shall be lowered by means of well points and pumps, or by other means acceptable to the Engineer, to the extent necessary to keep the trench free from water and the trench bottom stable at all times when work within the trench is in progress. The disposal of water from trench dewatering operations shall be subject to the approval of the Engineer at all times; such waste water shall be conducted to existing drainage ditches, channels or drains. Surface water shall be diverted to prevent it from entering trenches.

1.08 EARTH EXCAVATION BELOW PIPE SUBGRADE:

A. Pipe trenches shall be excavated below pipe subgrade elevations, as shown on the Plans to provide for the installation of granular pipe embedment material as specified hereinafter.

1.09 PIPE CLEARANCE IN ROCK:

A. Where rock is encountered in excavating and where it is necessary to place pipe in rock excavation, the rock shall be removed to provide a minimum clearance, for the size of the pipe being laid as set forth in the following table:

	Minimum Clearance	
Size of Pipe	Below Pipe	At Side of Pipe
12" AND SMALLER	6"	3"
15", 18" AND 21"	6"	4"

B. The clearance figures given in the above table are minimum clearances from the closest projection of the rock to the outside edge of the pipe, and are not average figures. All material removed from the trench in order to provide the above-specified clearance shall be replaced below and at the sides of the pipe with granular material as specified hereinafter. All replacement materials specified shall be furnished and installed by and at the expense of the Contractor.

1.10 TRENCH BOTTOM STABILIZATION:

A. Trench bottoms which become soft, mucky, or otherwise unstable during construction operations shall be stabilized, by and at the expense of the Contractor, with one or more layers of crushed rock or other suitable material, where and as necessary to provide a firm and stable base for granular pipe embedment material. Not more than 1/2-inch depth of mud or muck shall be allowed to remain on the stabilized trench bottom when the granular fill pipe foundation material is installed.

1.11 ARTIFICIAL FOUNDATIONS IN TRENCHES:

A. Whenever so ordered by the Engineer, the Contractor shall excavate to such depth below grade as the Engineer may direct and the trench bottom shall be brought to grade with such material as the Engineer may order installed. All timber, concrete foundations, wooden inverts, pipes, posts, stringers, and/or saddles, made necessary by quicksand or other treacherous soil, shall be installed as directed by the Engineer. Compensation for extra excavation, timber, concrete, or other foundations, except where provided by contract unit prices, shall be made in accordance with the contract provisions for "Extra Work".

1.12 TRENCH BRACING AND SHEETING:

A. Except where trench banks are cut on a stable slope to prevent caving or sliding, trenches shall be properly and substantially braced, and sheeted if and where necessary, to prevent caving or sliding and to provide adequate protection to workmen and to the pipe line during and after the construction thereof. Sheeting shall not be pulled unless the pipe strength is sufficient to carry trench loads based on the trench width to the back of the sheeting. Also, it shall not be pulled after backfilling. When ordered by the Engineer, wood sheeting shall be left permanently in the trench. Where sheeting is left in place, such sheeting shall not be braced against the pipe, but shall be supported by stakes driven into the trench bottom on each side of the pipe and with the tops of the stakes supported by cross braces above the top of the pipe or by other means, approved by the Engineer, which will not result in the application of concentrated loads or horizontal thrusts on the pipe. Cross braces installed above the pipe for the purpose of supporting sheeting in the bottom of the trench may be removed after the specified pipe embedment has been completed beyond the point of cross brace removal.

1.13 BELL HOLES:

A. Excavation for bell holes for the various types of joints to be made, excavation for assembling and bolting mechanical joints or couplings, excavation in trench banks to provide additional working space, and any other excavation outside of rough excavation limits which may be required for pipe jointing operations shall be performed prior to the installation of the specified granular fill below pipe subgrade elevations to prevent contamination of the granular fill pipe foundation material.

B. Bell holes for mechanical joints in pipe shall provide adequate clearance for the tools and methods used in installing and bolting the joints.

C. Bell holes for boltless gasketed joint pipe shall be excavated to provide at least one-inch clearance between the pipe bell and the bottom of the bell hole.

D. Regardless of the type of joint, all excavations therefore shall be of sufficient size and depth that the joints can be properly made and so that no part of the pipe bell, if any, will be in contact with the trench bottom of granular fill thereon.

1.14 TRENCH BACKFILL:

A. The kinds of backfill materials to be used and the methods of placing and compaction therefore shall conform to the requirements shown on the Plans. Inundated backfill shall not be permitted without special consideration and approval of the Engineer.\

B. Select Fill: Select material excavated from the existing trench, or imported, shall be used for pipe embedment and/or replacement of rock. The material shall be free from rock, debris and vegetation and uniform in size not exceeding 1-inch clods. The material shall have proper moisture to promote optimum compaction.

1. All select fill material beneath the pipe shall be compacted no more than necessary, in order to insure a slightly yielding support for the pipe placed thereon. Such material shall be loosely poured or scattered into the trench, to a maximum depth of 12 inches at any point, before spreading or leveling. When deposited in the trench, select fill material beneath the pipe shall be spread and graded to provide a uniform and continuous support for the installed pipe at all points between bell holes or pipe joints, except that it will be permissible to disturb or otherwise damage the finished subgrade surface by the withdrawal of pipe slings or other lifting tackle. No blocking of the pipe to achieve proper grade will be allowed.

2. All select fill material above the bottom of the pipe shall be placed in, not to exceed 6-inch layers, and compacted by adequate tamping, vibration, slicing with a shovel, rodding or by a combination thereof. All backfill compaction equipment, and the results obtained thereby, shall be subject at all times to the approval of the Engineer.

C. Granular Fill: Granular material for pipe embedment or replacement of rock or unsuitable foundation material removed from trench bottoms shall consist of crushed stone or pea gravel and shall be free from clay, and other materials which would cause the materials to crack or cake.

1. All granular fill material beneath the pipe shall be compacted no more than necessary, in order to insure a slightly yielding support for the pipe placed thereon. Such material shall be loosely poured or scattered into the trench, to a maximum depth of 12 inches at any point, before spreading or leveling. When deposited in the trench, granular fill material beneath the pipe shall be spread and graded to provide a uniform and continuous support for the installed pipe at all points between bell holes or pipe joints, except that it will be permissible to disturb or otherwise damage the finished subgrade surface by the withdrawal of pipe slings or other lifting tackle. No blocking of the pipe to achieve proper grade will be allowed.

2. All granular fill material above the bottom of the pipe shall be placed in not to exceed 6 inch layers and compacted by adequate tamping, vibration, slicing with a shovel, rodding, or by a combination thereof. All backfill compaction equipment, and the results obtained thereby, shall be subject at all times to the approval of the Engineer.

a. Granular Fill - Pea Gravel: Natural stone; free of shale, clay, organic matter; graded in accordance with ANSI/ASTM C 136 within the following limits:

Sieve Size	Percent Retained
3/4-inch	0
1/2-inch	0 to 10
3/8-inch	30 to 60
No. 4	85 to 100
No. 8	95 to 100

D. Flowable Fill: Flowable fill for pipe shall be used when required by the Plans and also where conditions are such as to dictate the use thereof as determined by the Engineer. The flowable fill mix shall comply with the following criteria.

1. FLOWABLE FILL CRITERIA:

a. Cement: ASTM C150, Type 1 Normal Portland, 0.60 percent or less alkalis where aggregates are alkali reactive. (100 lbs./cu.yd.)

b. Fine Aggregate: Fine, natural sand consisting of mineral aggregate particles. (2,600 lbs./cu.yd.)

c. Fly Ash: Class C, ASTM C618 (300 lbs./cu.yd.)

d. Water: Clean and not detrimental to concrete. (70 gallons/cu.yd.)

e. Compressive Strength: 50-100 psi at 28 days.

E. Pipe Embedment:

a. All pipe embedment material including bedding material below the bottom of the pipe shall be placed as shown on the Plans. Pipe embedment material shall extend upward to an elevation not less than 1/8 of the total trench backfill cover depth over the pipe or a minimum distance of 12 inches above the top of the pipe, whichever is greater, as shown on the Plans. Classes of pipe embedment to be used shall be as hereinafter specified.

b. Class A: Arch Encasement for pipe shall be used where required by the Plans and also where conditions are such as to dictate the use thereof as determined by the Engineer.

c. Class B: Bedding shall be used for all polyvinyl chloride pipe.

d. Class C: Bedding shall be used for all ductile iron pipe and concrete pipe.

F. Schedule:

1. Piping:

a. Bedding Fill: Granular fill bedding material, 4 inches below pipe invert to 12 inches above top of pipe, compacted to no less than 95% of maximum dry density at optimum moisture content.

b. Cover with subsoil fill, in 6-inch lifts, compacted to no less than 95% of maximum dry density at optimum moisture content.

c. Topsoil: 6 inches.

2. Pipe Under Paved Areas and Unpaved Roadways:

a. Bedding Fill: Granular fill bedding material, compacted to no less than 95% of maximum dry density at optimum moisture content.

b. Fill to Subgrade: Cover with subsoil fill, in 6-inch lifts, compacted to no less than 95% of maximum dry density at optimum moisture content.

c. Pipe Under Slab-on Grade or Structural Slab: Flowable fill material shall be placed in lieu of pipeline bedding materials for at least 5 feet beyond the structure perimeter.

3. If compacted backfill is required for the full depth of trench above the required granular fill, tamped bedding, or arch concrete encasement material, then tamped backfill shall be used in all cases unless permitted otherwise by the Engineer.

4. After each pipe has been graded, aligned and placed in final position on the bedding material and shoved home, sufficient pipe embedment material shall be deposited and compacted under and around each side of the pipe and back of the bell or end thereof to firmly hold and maintain the pipe in proper position and alignment during subsequent pipe jointing, embedment and backfilling operations.

5. Pipe embedment material, in each case, shall be deposited in the trench in such a manner that it is scattered along the sides of the pipe and not dropped in compacted masses. In addition, such material shall be deposited and compacted where required, uniformly and simultaneously on each side of the pipe in order to prevent lateral displacement of the pipe.

6. Under no circumstances shall the pipe embedment be disturbed or displaced after it has been adequately compacted by the moving or removal of trench boxes, or other equipment or personnel. If the pipe embedment is displaced, the contractor shall re-install those portions of the pipe laid which were disturbed.

1.15 BACKFILLING ABOVE PIPE EMBEDMENTS:

A. Except as otherwise permitted, trench backfill above previously compacted pipe embedment material shall conform to the material and placing requirements as follows.

B. Compacted Backfill:

C. Compacted backfill material shall have a moisture content such that the required density can be obtained by the compaction method used in each case. The limits of Compacted Backfill shall be as shown on the Construction Plans, or as stipulated below or as directed by the Engineer.

1. 95% of maximum density: Under pavements, surfacings, driveways, curbs, gutters, walks or other surface construction, structures, under road or highway shoulders and locations which are within 4-feet of any structure. Compacted backfill shall be completed immediately after pipe placement.

2. 90% of maximum density: Under established lawns or areas to sodded or seeded.

3. Compacted backfill shall be completed within two (2) days of pipe placement unless the moisture content exceeds the optimum.

4. The top portion of backfill beneath established sodded or cultivated areas shall be furnished with not less than 12 inches of topsoil.

5. The material shall be placed in layers and compacted by means of suitable equipment or by tamping with mechanical tampers or hand tampers. Each layer shall be compacted to a density equal to or greater than the percentage of maximum density indicated. Each successive layer shall contain only that amount of material which will insure proper compaction, but in no case shall any layer be greater than eight (8) inches (loose measurement) for 95% density or twelve (12) inches (loose measurement) for 90% density. The moisture content of the soil to be used for backfill shall be uniform and shall be within plus or minus two percentage points of optimum moisture for the soil.

6. The Contractor will be required to obtain an independent laboratory to determine the standard proctor density of the soil prior to construction if it has not already been determined. The maximum density of the soil shall be determined by ASTM Designation: D 698. The Contractor will also be required to provide independent representatives to perform field density tests of the compacted backfill in accordance with ASTM Designation D 2922 (Nuclear Method). The tests

shall be required to determine that the method of compaction being used by the Contractor achieves the specified density. The number of tests that required depends on the success and consistency of the Contractor in achieving the specified density. The Minimum number of tests to be performed shall be one for each 1000 feet of pipe laid, or fraction thereof and determined by the Engineer. The Engineer reserves the right to determine the locations of the tests. When the tests indicate that a specified density has not been accomplished, the Contractor shall re-work the area until a successful test is achieved. Cost of retesting due to failure shall be the responsibility of the Contractor. The Engineer or Owner reserves the right to test any portion of the job independent of the Contractor's testing representative.

D. Standard Backfill:

1. Standard Backfill material above pipe embedments may be placed by any method or combination of methods, approved by the Engineer, which will cause the density of the backfill material to be approximately equal to the adjacent undisturbed material, which will not subsequently settle and cause a depression in the trench area and which will not impose excessive concentrated or unbalanced loads, shock or impact on, and which will not result in displacement of the installed pipe.

2. Standard earth backfill material which is to be placed above embedments shall be free of brush, roots more than 2 inches in diameter, debris and junk, but may contain rubble and detritus from rock excavation, stones, and boulders, in certain portions of the trench depth as hereinafter provided.

3. Compact masses of stiff, mucky clay, or gumbo, or other consolidated material more than one cubic foot in volume shall not be permitted to fall more than five feet into the trench unless cushioned by at least 2 feet of loose backfill above the specified pipe embedment.

4. No standard trench backfill material containing rock, or rock excavation detritus, shall be placed in the upper 12 inches of the trench except with the specific permission of the Engineer in each case, nor shall any hard rock, or stone or boulder larger than 8 inches in its greatest dimension be placed within 2 feet of the top of pipe having a cover depth less than 10 feet, or within 3 feet of the top of pipe laid in deeper trenches. Large stones not exceeding 12 inches may be placed in the remainder of the trench backfill only if well separated and so arranged that no interference with backfill settlement will result.

E. Hand Placed Backfill: All hand placed backfill shall be deposited and spread with tools in uniform layers not more than 12 inches in thickness on each side of the pipe and for the full width of the trench where above the pipe.

F. Inundated Sand Backfill: Inundated sand backfill shall only be used with express permission from the Engineer. Sand used for inundated sand backfill shall be free of lumps, rubbish, roots, cinders and other objectionable material. Backfill sand shall contain not more than 10 percent by weight of clay and loam combined, not more than 5 percent shall be retained on a No. 4 sieve, and not more than 20 percent shall pass a No. 100 sieve.

1. The general procedure to be employed in the inundation of sand backfill with water shall be submitted by the Contractor to, and approved by, the Engineer prior to starting operations thereunder. Operational details in connection therewith shall be acceptable to the Engineer at all times.

2. Unless otherwise authorized by the Engineer, an adequate supply of water shall be available at the site of each water-settled sand fill to completely inundate the sand to the top of the trench, or structure subgrade, in one uninterrupted operation. However, in order to reduce the loss of water

by seepage into a porous subsoil, the Engineer may permit stage inundation of successive layers of sand in the trench.

3. No compacted backfill shall be installed in freezing weather except by permission of the Engineer, and in no case shall backfilling be done with frozen material or on material already frozen in the trench.

4. Backfill meeting the above requirements may be done prior to specified pipe line testing at the Contractor's option. This will be allowed to prevent displacement of the pipe during testing operations. Should the pipe not withstand the hydrostatic testing as outlined in these specifications, the Contractor shall be required to uncover, correct and backfill the pipe without additional cost to the Owner.

1.16 EXCAVATION FOR STRUCTURES:

A. Excavation for structures shall meet the requirements of SECTION: EXCAVATION FOR STRUCTURES.

1.17 STRUCTURE BACKFILL:

A. Backfill material around and outside of structures shall be of a type, and placed and compacted as specified for the trench backfill adjacent thereto.

1.18 DRAINAGE MAINTENANCE:

A. Backfilling of trenches for pipe installed beneath and/or across roadways, driveways, walks and other traffic ways adjacent to drainage ditches and water courses shall not be done prior to the completion of backfilling to the original ground surface of the trench on the upstream side of such trafficway in order to prevent the impounding of water at any point after the pipe has been laid, and all necessary bridges and other temporary structures required to maintain traffic across such unfilled trenches shall be constructed and maintained. Backfilling shall be done in such a manner that water will not accumulate in unfilled or partially filled trenches. All material deposited in roadway ditches or other water course crossed by the line of trench shall be removed immediately after backfilling is completed and the section, grades and contours of such ditches or water courses restored to their original condition, in order that surface drainage will be obstructed no longer than necessary.

1.19 PROTECTION OF TRENCH BACKFILL IN DRAINAGE COURSES:

A. Where trenches are constructed in or across ditches or other water courses the backfill shall be protected from surface erosion by adequate means. When the grade of the ditch exceeds one percent, suitable ditch checks as approved by the Engineer shall be installed as directed. Ditch checks may be of CCA treated lumber, stone, or concrete as authorized. In any case, the ditch check shall extend less than two (2) feet below the original ditch or water course bottom for the full bottom width and not less than eighteen (18) inches into the side slope thereof.

1.20 DISPOSAL OF EXCESS EXCAVATED MATERIALS:

A. Except as otherwise permitted or directed by the Engineer, all excess excavated materials shall be disposed of away from the site of the work.

B. Broken concrete and other coarse debris resulting from pavement or sidewalk removal, excavated rock in excess of the amount permitted to be and actually installed in trench backfill, junk and debris encountered in excavation work, and other similar waste materials shall be disposed of away from the site of the work.

C. The excess suitable material, and unsuitable material, shall be disposed of at locations approved by the Engineer and/or as indicated on the Plans. The material disposed of shall be spread in a neat appearance, and smooth enough as not to constitute a hazard to humans and animals. The final appearance shall be subject to the approval of the Engineer. If disposal is on private property, the Contractor shall obtain written permission of the property owner on whose property the material is to be placed. Copies of all agreements with property owners are to be furnished to the Engineer.

1.21 BORE WITHOUT ENCASEMENT:

A. Utility lines constructed at specific locations as designated on the Plans shall be installed without encasements and shall be placed by boring, or a combination of jacking and boring. The pipe shall be of the size and length as indicated on the Plans and installed accurately to line and grade. The minimum cover specified on the Plans shall be maintained. Working pits shall be excavated at each end of the bore and shall be adequately shored to prevent slipping or reveling of the embankment. The working pits shall be provided with sumps for dewatering.

B. The line and grade shall be checked at least once per shift as the work progresses.

C. After construction of the bore, the utility line shall be properly aligned, graded and installed as indicated on the Plans.

1.22 BORE AND ENCASEMENT: Utility lines constructed at specific locations as designated on the Plans shall be installed without encasements and shall be placed by jacking and boring. The pipe shall be of the size and length as indicated on the Plans and installed accurately to line and grade. The minimum cover specified on the Plans shall be maintained. Working pits shall be excavated at each end of the bore and shall be adequately shored to prevent slipping or reveling of the embankment. The working pits shall be provided with sumps for dewatering.

A. The pipe supports shall be accurately placed as the carrier pipe enters the encasement pipe.

B. After construction of the bore, the utility line shall be properly aligned, graded and installed as indicated on the Plans.

C. Installation of the specific utility line in the pipe encasement and material for the pipe encasement shall meet the requirements specified on the Plans.

1.23 STREETS AND ROADWAY CROSSINGS:

A. Pipelines constructed under streets and roadways may be constructed by open cut trenching at specific locations designated on the Plans. The Contractor shall install suitable barricades and lights at open trenches and take any precautions necessary to protect the public from damage as a result of the construction operations. The Contractor shall comply with the Manual on Uniform Traffic Control Devices for Streets and Highways, when controlling the traffic at these locations as set forth in SECTION: SUPPLEMENTARY CONDITIONS.

1.24 INTERRUPTION OF TRAFFIC:

A. Interruption of through traffic on City streets will be kept to a minimum and provisions shall be made to permit local traffic to serve residents in the vicinity of the work at all times as outlined in the SECTION: SUPPLEMENTARY CONDITIONS.

B. The Contractor will be financially responsible for any damage or suits arising from street and road crossings and shall save and hold harmless the Owner, utility Owner and the Engineer from any claims arising from this construction.

1.25 PROTECTION OF TREES AND SHRUBBERY:

A. Only those trees shown on the Plans or as directed by the Engineer shall be protected.

B. Main tree roots shall not be cut except where they fall within the area to be occupied by the pipe. Excavation shall be done by hand where necessary to prevent injury to roots or trees. Trees which are left standing shall be adequately protected from permanent damage by reason of construction operations.

1.26 FINISH GRADING:

A. The Contractor shall finish grade all disturbed areas to a degree acceptable for the application of seed, fertilizer and mulch as required below.

B. General: Equipment necessary for the proper preparation of the ground surface and for handling and placing all required materials shall be on hand, in good condition, and shall be approved before the work is started.

C. Clearing: Prior to grading and tillage operations, vegetation on the site that might interfere with grading, tillage, or seeding operations shall be mowed, grubbed, raked and burned or removed from the site and the ground surface cleared of stumps, stones, roots, cable, wire, grade stakes, and other materials that might hinder proper grading, tillage, seeding, or subsequent maintenance operations.

D. Grading: Grades that have been previously established, as shown on the Plans, shall be maintained in a true and even condition. Maintenance shall include necessary repairs to previously graded areas. Surfaces shall be left at the prescribed grades in an even and properly compacted condition so as to prevent the formation of depressions where water will stand.

E. Tillage: After the areas required to be treated have been brought to the grades shown on the Plans, the areas shall be thoroughly tilled to a depth of at least three inches by plowing, discing, harrowing, or other approved method until the condition of the soil is acceptable. The work shall be performed only during periods where beneficial results are likely to be obtained. When conditions are such, by reason of drought, excessive moisture, or other factors, that satisfactory results are not likely to be obtained, the work will be stopped and shall be resumed only when directed. Undulations or irregularities in the surface that would interfere with further construction operations or maintenance shall be leveled before the next specified operation.

F. Cleanup: After completion of the above operations, the surface shall be cleared of stones, stumps, or other objects larger than two inches in thickness or diameter, and of roots, brush, wire, grade stakes, and other objects that might be a hindrance to maintenance operations. Paved areas over which hauling operations are conducted shall be kept clean, and soil or other dirt that may be brought upon the surface shall be removed promptly. The wheels of vehicles shall be cleaned to avoid bringing dirt upon the surface of roads and other paved areas. Cleaning operations shall be conducted with care to prevent damage to underlying pavement.

1.27 FIELD QUALITY CONTROL:

A. Top Surface of Backfilling under Paved Areas: Plus or minus ½-inch from required elevations.

B. Field inspection and testing will be performed under provisions of SECTION: TESTING SERVICES.

C. Moisture-density relation tests of fill material will be performed in accordance with ANSI/ASTM D 698 and with SECTION: TESTING SERVICES.

D. Compaction testing will be performed in accordance with ASTM 2922 and with SECTION: TESTING SERVICES.

E. During construction of embankments or backfills or preparation of subgrade soil, moisture content shall be determined in accordance with ASTM D 2216 or ASTM D 3017.

F. If tests indicated Work does not meet specified requirement, the Contractor shall remove Work, replace and retest at no cost to the Owner.

G. Frequency of Tests: Trench Backfill: One per lift per 500 linear feet or one per lift in shorter runs.

H. Recompact fills subjected to vehicular traffic.

END OF SECTION 02220

SECTION 02222

EXCAVATING

PART 1 - GENERA

1.01 SECTION INCLUDES
A. Excavating for new site work.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

3.01 PREPARATION
A. Identify required lines, levels, contours, and datum.
B. Locate, identify, and protect utilities that remain, from damage.
C. Notify utility company to remove and relocate utilities.
D. Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.
E. Protect bench marks, existing structures, fences, sidewalks, paving and curbs from excavation equipment and vehicular traffic.

3.02 EXCAVATION
A. Underpin adjacent structures which may be damaged by excavation work.
B. Excavate subsoil required to accommodate building foundations, slabs-on-grade, paving and site structures, construction operations.
C. Machine slope banks to angle of repose or less, until shored.
D. Do not interfere with 45 degree bearing splay of foundation.
E. Grade top perimeter of excavation to prevent surface water from draining into excavation.
F. Hand trim excavation. Remove loose matter.
G. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume.
H. Notify Architect/Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
I. Correct areas over-excavated in accordance with Section 02223.
J. Stockpile excavated material in area designated on site and remove excess material not being reused, from site.

3.03 FIELD QUALITY CONTROL
A. Field inspection will be performed under provisions of the General Requirements.
B. Provide for visual inspection of bearing surfaces.

3.04 PROTECTION
A. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.
B. Protect bottom of excavations and soil adjacent to and beneath foundation, from freezing.

END OF SECTION 02222

SECTION 02223

BACKFILLING

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Building perimeter and site structure backfilling to subgrade elevations.
- B. Site filling and backfilling.
- C. Fill under slabs-on-grade, paving.
- D. Consolidation and compaction as scheduled.
- E. Fill for over-excavation.

1.02 REFERENCES
- A. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.

PART 2 PRODUCTS

2.01 FILL MATERIALS
- A. Fill: As specified in Section 02205.

PART 3 EXECUTION

3.01 EXAMINATION
- A. Verify subdrainage, dampproofing or waterproofing installation has been inspected and completed.

3.02 PREPARATION
- A. Compact subgrade to density requirements for subsequent backfill materials.
- B. Cut out soft areas of subgrade not capable of in situ compaction. Backfill with fill and compact to density equal to or greater than requirements for subsequent fill material.
- C. Scarify and proof roll subgrade surface to a depth of 8 to 12 inches to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.

3.03 BACKFILLING
- A. Backfill areas to contours and elevations with unfrozen materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- C. Fill, Place and compact materials in continuous layers not exceeding 8 inches compacted depth.
- D. Employ a placement method that does not disturb or damage other work.
- E. Maintain optimum moisture content of backfill materials to attain required compaction density. Backfill against supported foundation walls. Do not backfill against unsupported foundation walls.
- F. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.
- G. Slope grade away from building minimum 2 inches in 10 ft. unless noted otherwise.
- H. Make gradual grade changes. Blend slope into level areas.
- I. Remove surplus backfill materials from site.
- J. Leave fill material stockpile areas free of excess fill materials.

3.04 TOLERANCES
- A. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch from required elevations.
- B. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.05 FIELD QUALITY CONTROL
- A. Field inspection and testing will be performed under provisions of the General Requirements.
- B. Compaction testing will be performed in accordance with ANSI/ASTM D698.
- C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no additional cost to the Owner.
- D. Proof roll compacted fill surfaces under slabs-on-grade, and paving.

3.06 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of the General Requirements.
B. Reshape and re-compact fills subjected to vehicular traffic.

3.07 SCHEDULE

A. Interior Slab-On-Grade:
   1. Fill compacted to 95 percent Standard Proctor.
   2. Top 6" of Low Volume change material shall be crushed limestone gravel similar to KDOT AB-3, compacted to 95 percent of Standard Proctor.
   3. 4" sand base installed over the 6" AB-3.
B. Exterior Side of Foundation Walls Retaining Walls and Over Granular Filter Material and Foundation Perimeter Drainage:
   1. Fill to subgrade elevation, each lift, compacted to 90 percent of Standard Proctor.
C. Fill Under Grass Areas:
   1. Fill to 4 inches below finish grade.
D. Fill Under Asphalt or Concrete Paving:
   1. Compact subsoil to 95 percent of its maximum dry density Standard Proctor.
E. Fill to Correct Overexcavation:
   1. Lean concrete to minimum compressive strength of 1000 psi – new building addition.
   2. Compact approved fill to 95 percent of its maximum dry density Standard Proctor where allowed.

END OF SECTION 02223

SECTION 02225

TRENCHING

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Excavating trenches for utilities from 5 feet outside building to municipal utilities.
- B. Compacted fill from top of utility bedding to subgrade elevations.
- C. Backfilling and compaction.

1.02 REFERENCES
- A. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.

1.03 FIELD MEASUREMENTS
- A. Verify that survey bench mark and intended elevations for the Work are as shown on drawings.

1.04 COORDINATION
- A. Coordinate all work as required.
- B. Verify work associated with lower elevation utilities are complete before placing higher elevation utilities.

PART 2 PRODUCTS

2.01 FILL MATERIALS
- A. Fill: As specified in Section 02205.

PART 3 EXECUTION

3.01 PREPARATION
- A. Identify required lines, levels, contours, and datum.
- B. Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.
- C. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.
- D. Maintain and protect above and below grade utilities which are to remain.
- E. Cut out soft areas of subgrade not capable of in situ compaction. Backfill with fill and compact to density equal to or greater than requirements for subsequent backfill material.

3.02 EXCAVATION
- A. Excavate subsoil required for utilities to municipal utilities.
- B. Cut trenches sufficiently wide to enable installation and allow inspection.
- C. Do not interfere with 45 degree bearing splay of foundations.
- D. Hand trim excavation. Remove loose matter.
- E. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume.
- F. Correct areas over excavated in accordance with Section 02222.
- G. Stockpile excavated material in area designated on site and remove excess material not being used, from site.

3.03 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen materials.
B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
C. Granular Fill: Place and compact materials in continuous layers not exceeding 8 inches compacted depth.
D. Soil Fill: Place and compact material in continuous layers not exceeding 8 inches compacted depth.
E. Employ a placement method that does not disturb or damage foundation perimeter drainage, conduit or pipes in trench.
F. Maintain optimum moisture content of fill materials to attain required compaction density.
G. Remove surplus fill materials from site.
H. Leave fill material stockpile areas completely free of excess fill materials.

3.04 TOLERANCES

A. Top Surface of Backfilling: Plus or minus 1 inch from required elevations.

3.05 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of the General Requirements.
B. Compaction testing will be performed in accordance with ANSI/ASTM D698.
C. If tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest at no additional cost to the owner.

3.06 PROTECTION OF FINISHED WORK

A. Protect or reshape and recompact fills subjected to vehicular traffic during construction.

END OF SECTION 02225

SECTION 02260

EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes temporary excavation support and protection systems. **Contractor is responsible for all excavation support and protection systems as required by local, state, and OSHA regulations.**

B. Related Sections:
1. Division 1 Section "Temporary Facilities and Controls" for temporary utilities and support facilities.

1.3 PERFORMANCE REQUIREMENTS

A. Furnish, install, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting soil and hydrostatic pressure and superimposed and construction loads.
1. Prevent surface water from entering excavations by grading, dikes, or other means.
2. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.
3. Monitor vibrations, settlements, and movements.

B. Excavation support and protection must comply with ASHA, state and local requirements.

1.4 QUALITY ASSURANCE

A. Preinstallation:

1. Review methods and procedures related to excavation support and protection system including, but not limited to, the following:
a. Geotechnical report.
b. Existing utilities and subsurface conditions.
c. Proposed excavations.
d. Proposed equipment.
e. Monitoring of excavation support and protection system.
f. Working area location and stability.
g. Coordination with waterproofing.
h. Abandonment or removal of excavation support and protection system.

1.5 PROJECT CONDITIONS

A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated.

B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison

with original elevations and positions. Promptly notify Architect if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that are either new or in serviceable condition.

B. Shotcrete: Comply with Division 3 Section "Shotcrete" for shotcrete materials and mixes, reinforcement, and shotcrete application.

C. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.

1. Shore, support, and protect utilities encountered.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Locate excavation support and protection systems clear of permanent construction so that forming and finishing of concrete surfaces are not impeded.

D. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.

E. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

END OF SECTION 02260

SECTION 02513

ASPHALTIC CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. When so specified in this Section, materials, equipment and construction shall conform to the latest edition of the Standard Specifications for State Road and Bridge Construction as published by the Kansas Department of Transportation, (KDOT) hereinafter referred to as the "Standard Specifications".

B. Construction of bituminous mat base course and/or surfacing consists of laying a hot, plant-mixed bituminous paving mixture of designated thickness. Materials shall be heated and mixed in a central plant and shall be hot when laid and compacted. Equipment shall be standard type suitable for the purpose and subject to approval.

C. Asphaltic concrete paving; wearing binder or base course.

D. Subgrade preparation of 15% Flyash stabilization.

1.02 TESTING AND BALANCING

A. Testing and inspection of subgrade compaction, asphalt pavement mix(es) and testing of placed stabilizing base course and asphalt pavement shall be performed by independent testing laboratory, pre-approved by the Owner, and paid for by the Owner. Testing Lab shall be responsible to ensure all work meets or exceeds specification. Lab shall transmit test results directly to Architect in a timely manner. If testing indicates material or work does not meet specifications, Testing Lab shall contact Architect immediately. Testing and inspection shall be performed so as to minimize disruption to Work.

B. Allow testing laboratory access to the mixing plant for verification of weights or proportions, character of materials used and determination of temperatures used in the preparation of asphalt concrete mix.

C. The testing laboratory shall perform laboratory tests on proposed asphalt pavement mix(es) as required to determine conformity with requirements.

D. The testing laboratory shall perform two series of compaction tests for stabilizing base course and for each asphalt pavement.

E. When stabilizing base course or portion thereof has been placed and compacted in accordance with requirements, notify the testing laboratory to perform density tests. Do not place asphalt pavement until results have been verified and base course installation approved.

F. If compaction tests indicate the stabilizing base course or asphalt paving do not meet specified requirements, remove defective work, replace and retest.

1.03 QUALITY ASSURANCE

A. Perform Work in accordance with KDOT Standard Specifications for State Road and Bridge Construction.

B. Mixing Plant: Conform to KDOT standards.

C. Obtain materials from same source throughout.

D. Reference and follow recommendations in the Report of Subsoil Investigation, Pavement, GS No. 82DSA17

1.04 REGULATORY REQUIREMENTS

A. Conform to KDOT or local code for paving work on public property.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Do not place asphalt when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 PRODUCTS

2.01 TACK COAT

A. Each lift of bituminous mat base course which will be covered by another lift of bituminous mat, shall receive a bituminous tack coat. Material shall be Type SS-1H as specified in the "Standard Specifications." Equipment and construction requirements shall conform to Section 605 and related sections of the "Standard Specifications." Rate of application shall be as directed by Owner's Representative and shall be between 0.03 and 0.07 gallon per square yard.

2.02 BITUMINOUS MIXTURE AND MATERIALS

A. Mix shall conform to requirements of Sections 605 and related sections of the "Standard Specifications" and shall be approved by Architect. This approval shall be based on the following conditions:
   1. All materials shall be furnished by recognized producers.
   2. The hot mix plant shall be of a recognized type.
   3. The Contractor shall submit a complete Marshall Mix design for review and approval by the Architect for each plant location to be used for production.

B. New pavements shall be full depth asphalt with mixtures and compacted minimum thickness as follows. The following thicknesses are “minimum” guidelines and apply only if adequate soil conditions exist. Unusual soil conditions may dictate alternative measures. Refer to project geotechnical report and soil tests, if available. (If the Archtiect suspects unsatisfactory conditoins, soil testing should be requested from the Owner.)
   1. Light Traffic (Employee/Customer Parking):

Asphaltic Concrete	Asphaltic Concrete with Aggregate Base
6″ Hot-Mixed Asphalt Concrete 8" Moisture Conditioned & Compacted Subgrade	5″ Hot-Mixed Asphalt Concrete 6″ Well Graded Granular Base Course 8" Moisture Conditioned & Compacted Subgrade

   2. Heavy Traffic (delivery Drives and Loading Docks):

8″ Hot-Mixed Asphalt Concrete 8" Moisture Conditioned & Compacted Subgrade	7″ Hot-Mixed Asphalt Concrete 6″ Well Graded Granular Base Course 8" Moisture Conditioned & Compacted Subgrade

Mixes selected for the Hot-Mix Asphalt Concrete alternate can be KDOT HMA Commercial Grade (Class A) or APWA Type 6-01. If a Marshall designed mix is desired, any 50-blow Marshall mix may be selected meeting the aggregate and gradation requirements of KDOT BM- 2, APWA Type 2 or 3, or other locally produced Marshall mix that is equivalent to KDOT BM- 2. Any submitted 50-blow Marshall mix design should also be checked for resistance to stripping during design using AASHTO T 283 to determine if an antistripping agent is needed for the same asphalt concrete chosen for the project. The index of retained strength shall exceed 75%.

C. A slurry seal is acceptable if the base surface is stable and sufficient to bear the loads for that particular site and use of parcel of land (playground, parking lot, etc….).

D. Mineral Filler: Finely ground particles of limestone, hydrated lime or other mineral dust, free of foreign matter.

2.03 ACCESSORIES

A. Primer: Homogeneous, medium curing, liquid asphalt in accordance with KDOT standards.

B. Tack Coat: Homogeneous, medium curing, liquid asphalt in accordance with KDOT standards.

2.04 ASPHALT PAVING MIX

A. Use dry material to avoid foaming. Mix uniformly.
B. Binder Course: 4.5 to 6 percent of asphalt cement by weight in mixture in accordance with approved Marshal Mix design and KDOT standards.
C. Wearing Course: 5 to 7 percent of asphalt cement by weight in mixture in accordance with approved Marshal Mix design and KDOT standards.

2.05 SOURCE QUALITY CONTROL

A. Provide complete mix design for asphalt under provisions of the General Requirements.
B. Submit proposed mix design of each class of mix for review prior to commencement of work.
C. Test samples in accordance with KDOT.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that compacted subgrade, granular base, stabilized soil is dry and ready to support paving and imposed loads.
B. Verify gradients and elevations of base are correct.

3.02 PREPARATION OF SUBGRADE AND BASE

A. Ensure grading of subgrade to required elevation.
B. Scarify subgrade, where asphalt pavement is to be placed, to a depth a minimum of 8 inches, mix flyash to 15% and compact to 95% standard density.
C. Water and thoroughly mix subgrade with flyash to 15% until optimum moisture content is obtained when deficiency of moisture content exists. When excess of moisture exists, rework and aerate subgrade until optimum moisture content is obtained.
D. Before final rolling, shape entire section, add additional subsoil as required and compact subgrade to provide grades, elevation and cross-section indicated. Points of finished subgrade surface shall be within one inch of elevations indicated. Verify and work to existing grades and/or improvements to remain.
E. Prepare new bituminous base by the removal of all loose particles, mud, dirt, and other foreign material to as clean a condition as is practicable. Clean by the use of power brooms or other equivalent and approved methods; flushing with water may be required.

3.03 PREPARATION - PRIMER

A. Apply primer in accordance with manufacturer's instructions and KDOT specifications.

3.04 PREPARATION - TACK COAT

A. Apply tack coat in accordance with manufacturer's instructions and KDOT specifications.
B. Apply tack coat to contact surfaces of curbs, gutters and concrete edges.
C. Coat surfaces of frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

3.05 TRANSPORTATION AND DELIVERY OF HOT BITUMINOUS MIXTURE

A. Transport mixture from plant to point of use in pneumatic-tired vehicles having tight bodies previously cleaned of all foreign materials. Inside surface of each vehicle may be lubricated lightly with thin oil or soap solution prior to loading, but excessive use of lubricant or use of gasoline, kerosene, or similar products will not be permitted.
B. Material shall be weighed then delivered and dumped into hopper of a self-propelled power machine for placing and spreading material as hereinafter specified.
C. During transportation of hot bituminous mixtures from remote central mixing plant to point of usage and placement on the prepared subgrade or base course, provide trucks with tarpaulin covers or other adequate protection to prevent undue loss of heat. In any case, temperature of mixture at time of placement shall be within the range of 275 degrees F to 325 degrees F.

3.06 PLACING HOT BITUMINOUS MIXTURE

A. Place bituminous mixture in layers of not more than 4 inches compacted thickness.

B. Concrete structures, against which the bituminous base and surfacing courses are to be placed, shall receive a fog coat of bituminous material, as specified for tack coat, immediately prior to application of bituminous material.
C. Sweep surfaces clean with power broom accompanied by power blower or hand sweeping.
D. Equipment for spreading, shaping and finishing bituminous paving mixture shall consist of an approved self-contained power machine utilizing an integral electronic automatic control system and suitably equipped and operated to obtain a finished course of proper depth, grade and surface. Speed of machine shall be regulated so that the surface of pavement is smooth, and the pavement is at required grade and depth and conforms to designated profile and cross section.
E. Mixture shall be placed in strips not less than approximately 10 feet wide. After first strip has been compacted, place second strip and roll at least 1 foot of first strip. Where use of spreading machine is impractical, mixture may be spread by hand; dump on approved dump boards outside area to be paved, then spread with hot shovels and rakes into a loose layer of such depth that, when compacted, it will finish at required grade and thickness.

3.07 COMPACTION OF BITUMINOUS MIXTURES
A. Compact bituminous base and bituminous surface in accordance with the requirements specified in Section 02223.

3.08 JOINTS
A. All joints shall present the same texture, density and smoothness as other sections of the course. Placing of any course shall be as nearly continuous as possible.
B. Pass rollers over unprotected end of freshly laid mixture only when laying of the course is to be discontinued. In such case, make provisions for proper bond by cutting back the joint to expose an even, vertical surface for full thickness of the course.
C. Exposed edges shall be given a light paint coat of cutback asphalt. Rake fresh mixture against joints, thoroughly tamp and roll.

3.09 SMOOTHNESS TESTS
A. Finished surface of bituminous pavement shall not vary more than 1/4 inch when measured by 10-foot straightedge applied parallel to the centerline. Perform tests for conformity with specified crown and grade immediately after initial compression and any variation shall be corrected by removing or adding materials and continuing rolling.
B. After completion of final rolling, check smoothness again and correct irregularities that exceed specified tolerances or that retain water on the surface by removing defective work and replacing with new material or by adding additional material.

3.10 PLACING ASPHALT PAVEMENT - DOUBLE COURSE
A. Place asphalt binder course within 24 hours of applying primer or tack coat.
B. Place base course to specified compacted thickness.
C. Place surface course within two hours of placing and compacting binder course.
D. Place surface course to specified compacted thickness.
E. Install gutter drainage grilles and manhole frames in correct position and elevation.
F. Compact pavement by rolling. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.
G. Develop rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.11 TOLERANCES
A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straightedge.
B. Compacted Thickness: Within 1/4 inch.
C. Variation from True Elevation: Within 1/2 inch.

3.12 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of KDOT specifications.

B. Take samples and perform tests in accordance with applicable KDOT specifications.

3.13 PROTECTION

A. Immediately after placement protect pavement from mechanical injury for 2 days.

END OF SECTION 02513

SECTION 02700

PORTLAND CEMENT CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Concrete sidewalks, ramps, steps, trash area.

1.02 PERFORMANCE REQUIREMENTS
A. Paving: Designed for parking and light duty commercial vehicles.

1.03 QUALITY ASSURANCE
A. Perform work in accordance with ACI 301, requirements of Sections 03100, 03200 and 03300.
B. Obtain cementitious materials from same source throughout.

1.04 ENVIRONMENTAL REQUIREMENTS
A. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 PRODUCTS

2.01 FORM MATERIALS
A. Wood or Steel form material, profiled to suit conditions.
B. Joint Filler: ANSI/ASTM D1751 type; 3/4 inch thick.

2.02 REINFORCEMENT
A. Welded Steel Wire Fabric: Plain type, ANSI/ASTM A185; unfinished.
B. Reinforcing Steel: ASTM A615; 40 or 60 ksi yield grade; deformed billet steel bars; unfinished.

2.03 CONCRETE MATERIALS
A. Cement: ASTM C150 Air Entraining - Type IA Portland type, natural color.
B. Fine and Coarse Mix Aggregates: ASTM C33.
C. Water: Potable, not detrimental to concrete.
D. Air Entrainment: ASTM C260.
E. Chemical Admixture: ASTM C494, as approved by architect.

2.04 CONCRETE MIX - BY PERFORMANCE CRITERIA
A. Mix concrete in accordance with, ACI 304. Deliver concrete in accordance with ASTM C94.
B. Provide concrete to the following criteria:
   1. Provide concrete pavement mix design that has been previously approved for use on city streets in Russell, Kansas and approved by City of Russell Building Officials.
   2. Compressive Strength: Reference schedule below in Paragraph 3.10.
C. Use accelerating admixtures in cold weather only when approved by Architect/Engineer. Use of admixtures will not relax cold weather placement requirements.
D. Use calcium chloride only when approved by Architect/Engineer.
E. Use set retarding admixtures during hot weather only when approved by Architect/Engineer.

2.05 SOURCE QUALITY CONTROL
A. Submit proposed mix design of each class of concrete to the architect and appointed testing laboratory firm for review prior to commencement of work.
B. Tests on cement and aggregates shall be performed to ensure conformance with specified requirements.

PART 3 EXECUTION

3.01 EXAMINATION
- A. Verify compacted subgrade, granular base and stabilized soil is acceptable and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

3.02 PREPARATION
- A. Moisten base to minimize absorption of water from fresh concrete.
- B. Coat surfaces of manholes, catch basins and frames with oil to prevent bond with concrete pavement.
- C. Notify Architect/Engineer minimum 24 hours prior to commencement of concreting operations.

3.03 FORMING
- A. Place and secure forms to correct location, dimension, and profile.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.04 REINFORCEMENT
- A. Place reinforcement at mid-height of slabs-on-grade.
- B. Interrupt reinforcement at expansion joints.
- C. Place dowels and reinforcement to achieve pavement and curb alignment as detailed.
- D. Provide doweled joints 12 inch o.c. at interruptions of concrete.

3.05 PLACING CONCRETE
- A. Place concrete in accordance with ACI 301.
- B. Ensure reinforcement, inserts, embedded parts, are not disturbed during concrete placement.
- C. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
- D. Place concrete to indicated pattern.

3.06 JOINTS
- A. Place 1 inch expansion joints at 50 foot intervals or more frequently as noted on drawings. Align curb, gutter, and sidewalk joints. Seal all expansion joints with self-leveling sealant.
- B. Where concrete abuts building provide 1/2” expansion joint with joint filler and self-leveling sealant.
- B. Place joint filler between paving components and building or other appurtenances. Recess top of filler 1/4 inch for sealant placement by Section 07900.
- C. Provide scored or sawn joints at intervals equal to sidewalk width, unless noted otherwise. Scored and sawn joints at curbs and parking lots shall be at 10 feet on-center each way.
- D. Saw cut contraction joints 3/16 inch wide at an optimum time after finishing. Cut 1/3 into depth of slab.

3.07 FINISHING
- A. Parking: Light broom.
- B. Sidewalk Paving: Light broom, radius to 1/4 inch and trowel joint edges.
- C. Handicapped Ramps: Reference ADA. Sloped sections shall have raised circular texture. Contractor to install pre-manufactured pavers or fiberglass forms.
- D. Curbs and Gutters: Trowel finish.
- E. Inclined Vehicular Ramps: Broom perpendicular to slope.
- F. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.08 FIELD QUALITY CONTROL
- A. Three concrete test cylinders shall be taken for every 100 or less cu yds of each class of concrete placed each day.
- B. One additional test cylinder shall be taken during cold weather and cured on site under same conditions as concrete it represents.
- C. One slump test shall be taken for each set of test cylinders taken.

3.09 PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

3.10 SCHEDULES

A. Concrete sidewalks, ramps and steps: 4,000 psi 28 day concrete, 4 inches thick, 6x6 – W1.4 x W1.4 W.W.F. reinforced, natural color Portland cement, broom finish, detectable warnings per ADA at ramps and curb cuts.

B. Trash Area:

1. Heavy duty: 4,000 psi 28 day concrete, 6 inches thick, 6x6 – W4 x W4 W.W.F. reinforced, natural color Portland cement, broom finish.

END OF SECTION 02700

SECTION 03100

CONCRETE FORMWORK

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.
- B. Openings for other work.
- C. Form accessories.
- D. Form stripping.

1.02 DELIVERY, STORAGE, AND HANDLING
- A. Deliver, store, protect and handle products to site per the suppliers and/or manufacturer's recommendations.
- B. Store off ground in ventilated and protected manner to prevent deterioration from moisture.

1.03 COORDINATION
- A. Coordinate this Section with other Sections of work which require attachment of components to formwork.
- B. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Architect/Engineer.

PART 2 PRODUCTS

2.01 WOOD FORM MATERIALS
- A. Form Materials: At the discretion of the Contractor.

2.02 PREFABRICATED FORMS
- A. Preformed Steel Forms: Minimum gage matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
- B. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.

2.03 FORMWORK ACCESSORIES
- A. Form Ties: Removable or Snap-off type, metal, size and shape to minimize filling, waterproofing and refinishing concrete surfaces.
- B. Form Release Agent: Colorless mineral oil which will not stain concrete, or absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.
- C. Corners: Chamfer, exposed edges 1/2 inch unless otherwise noted or detailed on the drawings.
- D. Dovetail Anchor Slot: Galvanized steel, 22 gage thick, release tape sealed slots, anchors for securing to concrete formwork.
- E. Flashing Reglets: Galvanized steel 22 gage thick, longest possible lengths, with alignment splines for joints, release tape sealed slots, anchors for securing to concrete formwork.
- F. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.
- G. Waterstops: Rubber Polyvinyl chloride, minimum 1,750 psi tensile strength, minimum 50 degrees F to plus 175 degrees F working temperature range, maximum possible lengths, ribbed profile, preformed corner sections, heat welded jointing.

PART 3 EXECUTION

3.01 EXAMINATION
- A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 EARTH FORMS

A. Earth forms if permitted, hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

3.03 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to over stressing by construction loads.
C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
D. Align joints and make watertight. Keep form joints to a minimum.
E. Obtain approval before framing openings in structural members which are not indicated on Drawings.
F. Provide chamfer strips on external corners of beams joists columns and exposed decorative concrete edges.
G. Install void forms in accordance with manufacturer's recommendations. Protect forms from moisture or crushing.

3.04 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings which are effected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in passing through concrete work.
B. Locate and set in place items which will be cast directly into concrete.
C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.
D. Position recessed reglets for brick veneer masonry anchors to spacing and intervals specified in Section 04300.
E. Install accessories in accordance with manufacturer's instructions, straight, level, and plumb. Ensure items are not disturbed during concrete placement.
F. Install waterstops continuous without displacing reinforcement. Heat seal joints watertight.
G. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
H. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.06 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.
B. Clean formed cavities of debris prior to placing concrete.
C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.07 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 301

3.08 FIELD QUALITY CONTROL

A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.
B. Do not reuse wood formwork more than 2 times for concrete surfaces to be exposed to view. Do not patch formwork.

3.09 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

END OF SECTION 03100

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Reinforcing steel bars, wire fabric and accessories for cast-in-place concrete.

1.02 SUBMITTALS
A. Submit under provisions of the General Requirements.
B. Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel and wire fabric, bending and cutting schedules, and supporting and spacing devices.

1.03 QUALITY ASSURANCE
A. Perform Work in accordance with CRSI - Manual of Standard Practice and ACI 301.

1.04 COORDINATION
A. Coordinate with placement of formwork, formed openings and other Work.

PART 2 PRODUCTS

2.01 REINFORCEMENT
A. Reinforcing Steel: ASTM A615, 40, 60, or 75 ksi yield grade as indicated on the drawings; deformed billet steel bars, unfinished.
B. Reinforcing Steel Plain Bar and Rod Mats: ASTM A704, ASTM A615, Grade 40 or 60 as indicated on the drawings; steel bars or rods, unfinished.
C. Stirrup Steel: ANSI/ASTM A82, unfinished.
D. Welded Steel Wire Fabric: ASTM A815; in flat sheets; unfinished.

2.02 ACCESSORY MATERIALS
A. Tie Wire: Minimum 16 gage annealed type.
B. Chairs, Bolsters, Bar Supports, Spacers: Metallic, sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor barrier puncture.
C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic coated steel type; size and shape as required, as indicated on plans and details.

2.03 FABRICATION
A. Fabricate concrete reinforcing in accordance with CRSI Manual of Practice.
B. Weld reinforcement in accordance with ANSI/AWS D1.4.
C. Locate reinforcing splices not indicated on drawings, at point of minimum stress.

PART 3 EXECUTION

3.01 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
B. Do not displace or damage vapor barrier.
C. Accommodate placement of formed openings.
D. Maintain concrete cover around reinforcing as indicated on the drawings or if not indicated as follows:

Item	Coverage
Beams	1 1/2 inch
Column Ties	1 1/2 inch
Walls (exposed to weather or backfill)	2 inch
Footings and Concrete Formed Against Earth	3 inch
Slabs on Fill	1 inch

END OF SECTION 03200

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Cast-in-place concrete floors, footings and foundation walls.
- B. Floors and slabs on grade.
- C. Control, expansion and contraction joint devices associated with concrete work, including joint sealants.
- D. Equipment pads.

1.02 SUBMITTALS
- B. Product Data: Provide data on joint devices, attachment accessories.
- C. Samples: Submit 2-inch long samples of expansion/contraction joint.
- D. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent Work.
- E. Concrete Mix Design Proportions.
  1. Submit as specified in Part 2, Paragraph 2.05 F. Mix Proportions, this section, before placing concrete.
  2. Submit for each mix design.
  3. Resubmit for any change in mix design.
  4. Submit backup test data to verify strengths in accordance with ACI 301 and 318.

1.03 PROJECT RECORD DOCUMENTS
- A. Accurately record actual locations of embedded utilities and components which are concealed from view.

1.04 QUALITY ASSURANCE
- A. Codes
  1. 2012 International Building Code.
  2. ACI Specifications for Structural Concrete Buildings.
  3. Perform Work in accordance with ACI 318 Building Code Requirements for Reinforced Concrete.
  4. Acquire cement and aggregate from same source for all work.
  5. Conform to ACI 305R when concreting during hot weather.
  6. Conform to ACI 306R when concreting during cold weather.
- B. Testing
  1. Employ acceptable testing laboratory to perform materials evaluation, testing and design of concrete mixes. Testing shall comply with:

Sampling:	ASTM C 172
Slump	ASTM C 143 (4” to 6” slump)
Air Content:	ASTM C 173
Compressive Strength	ASTM C 39

  2. Concrete materials shall comply with these standards:

Portland Cement:	ASTM C 150, Type as required
Aggregates:	ASTM C 33
Water:	Potable
Air-Entraining Admixture:	Allowed (Not allowed in slabs to receive a hard-trowel finish)
Water-Reducing Admixture:	ASTM C 494
Membrane-Forming Curing Compound:	ASTM C 309, Type I
Deformed Reinforcing Bars:	ASTM A 615, Grade 60
Welded Wire Fabric:	ASTM A 185
Ready-Mix Concrete:	ASTM C 94
Placement in Cold Weather:	ACI 306
Placement in Hot Weather:	ACI 305

1.05 COORDINATION
- A. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS

A. Cement: ASTM C150, Type I - Normal or Type III - High Early Strength Type V - Sulfate Resistant as required Portland type.
B. Fine and Coarse Aggregates: ASTM C33.
C. Water: Clean and not detrimental to concrete.

2.02 ADMIXTURES

A. Air Entrainment: Per ASTM C260 at footings and foundations.
B. Chemical: ASTM C494 Type A - Water Reducing, Type B - Retarding, Type C - Accelerating, Type D - Water Reducing and Retarding, Type E - Water Reducing and Accelerating.

2.03 ACCESSORIES

A. Bonding Agent: Polymer resin emulsion, polyvinyl acetate, Latex emulsion, two component modified epoxy resin, non-solvent two component polysulfide epoxy, mineral filled polysulfide polymer epoxy, mineral filled polysulfide polymer epoxy resin, or Polyamid cured epoxy as approved.
B. Vapor Barrier: 15 mil thick clear polyethylene film, type recommended for slab on grade application.
C. Non-Shrink Grout: Premixed compound consisting of nonmetallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.
D. Curing Compound: Liquid membrane-forming compound conforming to ASTM C 309, Type 1. Curing compound used on floors to be sealed, painted, tiled, or covered with resilient floor covering shall be guaranteed not to interfere with application of sealers, paint, tile mortar, or tile adhesive after 28-day curing period. Areas to receive carpet tile and VCT flooring shall receive Aquron 2000 Cure and Seal.

2.04 JOINT DEVICES AND FILLER MATERIALS

A. Joint Filler:
   1. Joint Filler Type A: ASTM D1751; Asphalt impregnated fiberboard or felt, 1/4 inch thick.
   2. Joint Filler Type B: ASTM D1752; Closed cell polyvinyl chloride foam, resiliency recovery of 95 percent if not compressed more than 50 percent of original thickness.
B. Expansion and Contraction Joint Devices: ASTM B221 alloy, extruded aluminum; resilient elastomeric, vinyl, or neoprene, filler strip with a Shore A hardness of 35 to permit plus or minus 25 percent joint movement with full recovery; extruded aluminum or vinyl cover plate, of longest manufactured length at each location, recess mounted; color as selected.
C. Sealant: Rubber or synthetic rubber compound.

2.05 CONCRETE MIX

A. Mix concrete in accordance with ACI 304. Deliver concrete in accordance with ASTM C94.
B. Select proportions for normal weight concrete in accordance with ACI 301.
C. Provide concrete with compressive strength as indicated on structural drawings.
D. Use accelerating admixtures in cold weather only when approved by Architect/Engineer. Use of admixtures will not relax cold weather placement requirements.
E. Use set retarding admixtures during hot weather only when approved by Architect/Engineer.
F. Mix Proportions.
   1. Concrete shall be homogeneous, readily placeable, and uniformly workable; proportioned to conform to ACI 211.1.
   2. Mix proportions for all concrete shall be selected preferably on the basis of field experience, but in the case where sufficient or suitable strength test data is not available, concrete shall be proportioned on the basis of laboratory trial mix design. Designs shall conform to ACI 301.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify requirements for concrete cover over reinforcement.
B. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

3.02 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
B. In locations where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.
C. Use forms for all concrete except footings may be earth formed. Adequately brace and stiffen forms to prevent deflection and settlement.

3.03 PLACING CONCRETE

A. Place concrete in accordance with ACI 301.
B. Notify Architect/Engineer minimum 24 hours prior to commencement of operations.
C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints are not disturbed during concrete placement.
D. Install vapor barrier under interior slabs on grade. Lap joints minimum 6 inches and seal watertight by sealant applied between overlapping edges and ends or taping edges and ends.
E. Repair vapor barrier damaged during placement of concrete reinforcing. Repair with vapor barrier material; lap over damaged areas minimum 6 inches and seal watertight.
F. Separate slabs on grade from vertical surfaces with 1/2 inch thick joint filler.
G. Place joint filler in floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
H. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface. Conform to Section 07900 for finish joint sealer requirements.
I. Install joint devices in accordance with manufacturer's instructions.
J. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
K. Install joint device anchors. Maintain correct position to allow joint cover to be flush with floor and wall finish.
L. Install joint covers in longest practical length, when adjacent construction activity is complete.
M. Apply sealants in joint devices in accordance with Section 07900.
N. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
O. Place concrete continuously between predetermined expansion, control, and construction joints.
P. Do not interrupt successive placement; do not permit cold joints to occur where possible.
Q. Place floor slabs in saw cut pattern indicated. Cut joints with power blade as soon as concrete surface is firm enough to resist tearing or damage by the blade and before random shrinkage cracks can occur (Usually required 4 to 12 hours after finishing).
R. Saw cut joints within 24 hours after placing. Use 3/16 inch thick blade, cut into 1/4 depth of slab thickness.
S. Screed floors and slabs on grade level, maintaining surface flatness of maximum 1/4 inch in 10 ft.
T. Place concrete on properly prepared and unfrozen subgrade and only in dewatered excavations.

3.04 CONCRETE FINISHING

A. Provide formed concrete surfaces to be left exposed concrete walls columns beams joists with smooth rubbed finish.
B. Finish concrete floor surfaces in accordance with ACI 301.
C. Wood float surfaces which will receive quarry tile, ceramic tile, or terrazzo with full bed setting system.
D. Steel trowel surfaces which will receive carpeting, resilient flooring, seamless flooring, thin set quarry tile, or thin set ceramic tile.
E. Steel trowel surfaces which are scheduled to be exposed.
F. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1/4 inch per foot or as indicated on drawings.

3.05 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
D. Cure floor surfaces in accordance with ACI 308.
E. At areas scheduled to receive stained concrete floor finish, use only curing components and methods approved by the stain manufacturer.
F. Ponding: Maintain 100 percent coverage of water over floor slab areas continuously for 4 days.

G. Spraying: Spray water over floor slab areas and maintain wet for 7 days.
H. Curing Compound: Cure with liquid membrane-forming compound conforming to ASTM C 309, Type I. Apply immediately after removal of forms (which have been continuously wet); or in case of a slab, after the concrete has been finished and is hardened sufficiently to walk on. Apply curing compound to all exposed surfaces immediately after removing form or after finishing concrete.

3.06 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed in accordance with ACI 301 and under provisions of the General Requirements.
B. Provide free access to Work and cooperate with appointed firm.
C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of Work.
D. Tests of cement and aggregates may be performed to ensure conformance with specified requirements.
E. Three concrete test cylinders will be taken for every 75 or less cu yds of each class of concrete placed. If 4" diameter cylinders are used, an additional cylinder shall be tested at 28 days.
F. One additional test cylinder will be taken during cold weather concreting, cured on job site under same conditions as concrete it represents.
G. One slump test will be taken for each set of test cylinders taken.
H. Water added to concrete having a slump below the specified minimum shall be at Contractor's risk. If the water added produces a slump greater than the specified maximum, the concrete will be rejected. If water is added, the concrete shall be remixed for a minimum of 25 revolutions. Three concrete test cylinders will be taken from every truck that water is added to at the jobsite.

3.07 PATCHING

A. Allow Architect/Engineer to inspect concrete surfaces immediately upon removal of forms.
B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect/Engineer upon discovery.
C. Patch imperfections as directed or in accordance with ACI 301.

3.08 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
B. Repair or replacement of defective concrete will be determined by the Architect/Engineer.
C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect/Engineer for each individual area.

END OF SECTION 03300

SECTION 04100

MORTAR AND MASONRY GROUT

PART 1 GENERAL

A. Mortar and grout for masonry.
B. Reference Section 04700 for Manufactured Masonry mortar.

1.02 GENERAL
A. All notes or specifications on structural drawings shall override any discrepancies listed.

1.03 SUBMITTALS
A. Submit under provisions of the General Requirements.
B. Include design mix, indicate whether the Proportion or Property specification of ASTM C270 is to be used, required environmental conditions, and admixture limitations.

1.04 QUALITY ASSURANCE
A. Perform Work in accordance with ACI 530 and ACI 530.1.

1.05 DELIVERY, STORAGE, AND HANDLING
A. Deliver, store, protect, and handle products to site under provisions of the General Requirements.
B. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.06 ENVIRONMENTAL REQUIREMENTS
A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.
B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

PART 2 PRODUCTS

2.01 MATERIALS
A. Portland Cement: ASTM C150, Type I, color to be selected at exposed areas.
B. Masonry Cement: ASTM C91, Type S, color to be selected at exposed areas.
C. Premix Mortar: ASTM C387, Type S, color to be selected at exposed areas.
D. Mortar Aggregate: ASTM C144, standard masonry type.
E. Hydrated Lime: ASTM C207, Type S.
F. Water: Clean and potable.
G. Bonding Agent: Latex or Epoxy type.

2.02 MORTAR COLOR
A. Mortar Color: Natural Gray

2.03 MORTAR MIXES
A. Mortar For Load Bearing Walls and Partitions: ASTM C270, Type N or S using the Property specification.
B. Mortar For Non-Load Bearing Walls and Partitions: ASTM C270, Type N or S using the Property specification.
C. Mortar For Engineered Masonry: ASTM C270, Type N or S using the Property specification.
D. Pointing Mortar: ASTM C270, Type N or O using the Property specification.

2.04 MORTAR MIXING
A. Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.
B. Maintain sand uniformly damp immediately before the mixing process.
C. Add mortar color and admixtures in accordance with manufacturer's instructions. Provide uniformity of mix and coloration.

D. Do not use anti-freeze compounds to lower the freezing point of mortar.
E. If water is lost by evaporation, re-temper only within two hours of mixing.
F. Use mortar within two hours after mixing at temperatures of 90 degrees F (32 degrees C), or two-and-one-half hours at temperatures under 40 degrees F.

2.05 GROUT MIXES
A. Bond Beams, and Lintels: 2,000 psi strength at 28 days; 8-10 inches slump; premixed type in accordance with ASTM C94.
B. Engineered Masonry: 2,000 psi strength at 28 days; 8-10 inches slump; premixed type in accordance with ASTM C94.

2.06 GROUT MIXING
A. Mix grout in accordance with ASTM C94.
B. Add admixtures in accordance with manufacturer's instructions; mix uniformly.
C. Do not use anti-freeze compounds to lower the freezing point of grout.

PART 3 EXECUTION

3.01 EXAMINATION
A. Request inspection of spaces to be grouted.

3.02 INSTALLATION
A. Install mortar and grout in accordance with premix mortar manufacturer's instructions.
B. Install mortar and grout in accordance with ASTM C270.
C. Work grout into masonry cores and cavities to eliminate voids.
D. Do not install grout in lifts greater than 16 inches or two CMU courses without consolidating grout by rodding.
E. Do not displace reinforcement while placing grout.
F. Remove excess mortar from grout spaces.

3.03 FIELD QUALITY CONTROL
A. Test and evaluate mortar in accordance with ASTM C780.
B. Test and evaluate grout in accordance with ASTM C1019.

END OF SECTION 04100

SECTION 04300

UNIT MASONRY SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Brick units.
- B. Reinforcement, anchorage, and accessories.

1.02 SUBMITTALS
- A. Submit under provisions of the General Requirements.
- B. Product Data: Provide data for masonry units and fabricated wire reinforcement.

1.04 QUALIFICATIONS
- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING
- A. Deliver, store, protect and handle products to site under provisions of the General Requirements.
- B. Accept units on site. Inspect for damage.

1.06 ENVIRONMENTAL REQUIREMENTS
- A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.
- B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.
- C. Hot Cold Weather Requirements: IMIAC - Recommended Practices and Guide Specifications for Hot or Cold Weather Masonry Construction.

PART 2 PRODUCTS

2.01 BRICK UNITS
- A. General: Provide shapes indicated and as follows for each form of brick required:
  1. Provide units with exposed surfaces finished for ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces.

- B. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.

- C. Face Brick: ASTM C 216, Grade MW or SW, and as follows:
  1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3000 psi.
  2. Initial Rate of Absorption: Less than 20 g/30 sq. inper minute when tested per ASTM C 67.
  3. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
  4. Size and Shape
     a. Modular: 3-5/8 inches deep by 2-1/4 inches high by 7-5/8 inches long.
  5. Application: Use where brick is exposed, unless otherwise indicated.
  6. Manufacturer, Color and Texture:
     a. Brick #1 (field color) - Summit Brick, Lakewood Plant, Red Matt.
     b. Brick #2 (accent color) – Lakewood Brick Company, Graphite/T-5 Matt.

2.02 REINFORCEMENT AND ANCHORAGE

A. Wall Ties: Formed steel wire, 3/16 inch thick, adjustable, hot dip galvanized to ASTM A123 steel finish. Slotted, dovetail type tie. Corrugated ties not accepted.

Manufacturers:

a) DUR-O-WALL
b) TRU-MESH
c) BET-R-WALL

2.03 MORTAR AND GROUT

A. Mortar and Grout: As specified in Section 04100.

2.04 ACCESSORIES

A. Preformed Control Joints: Rubber, Neoprene, Polyvinyl chloride material. Provide with corner and tee accessories, heat or cement fused joints.
B. Joint Filler: Closed cell polyvinyl chloride, polyethylene, polyurethane or rubber; oversized 50 percent to joint width; self expanding.
C. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.
D. Vapor Barrier: Tyvek Commercial Wrap
E. Nailing Strips: Softwood, preservative treated for moisture resistance, dovetail shape, sized to masonry joints.
F. Weeps: Preformed plastic cotton wick filled, or cotton rope. Extend up wall 18".
G. Cavity Vents: Molded polyvinyl chloride grilles; insect resistant.
H. Cavity wall mortar Net: 90% open area, full-wall-height x 2" wide, 18" minimum density PVC or nylon material set behind bottom brick courses between brick and flashing around all exterior veneer walls.

2.05 LINTELS

A. As detailed on drawings. All lintels shall be field painted to closely match adjacent masonry material.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.
B. Verify items provided by other sections of work are properly sized and located.
C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied to other sections.
B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.
B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
C. Brick Units:
   1. Bond: Running unless otherwise indicated.
   2. Coursing: Three units and three mortar joint to equal 8 inches in height.
   3. Mortar Joints: Concave, unless noted otherwise.

3.04 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
B. Lay hollow masonry units with face shell bedding on head and bed joints.
C. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.
D. Remove excess mortar as work progresses.
E. Interlock intersections and external corners.
F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

H. Cut mortar joints flush where wall tile is scheduled, resilient base is scheduled, cavity insulation vapor barrier adhesive is applied, or bitumen damp proofing is applied.
I. Isolate masonry partitions from vertical structural framing members with a control joint.
J. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.05 WEEPS

A. Install weeps in veneer at 32 inches o.c. horizontally above through-wall flashing, above shelf angles and lintels, at bottom of walls, and under precast concrete window sills.

3.06 CAVITY WALL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weeps.
B. Build inner wythe ahead of outer wythe to receive cavity insulation and air/vapor barrier adhesive.

3.07 REINFORCEMENT AND ANCHORAGE

A. Install horizontal joint reinforcement 16 inches o.c.
B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
C. Place joint reinforcement continuous in first and second joint below top of walls.
D. Lap joint reinforcement ends minimum 6 inches.
E. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
F. At masonry veneer, attach wall ties to metal studs at back-up wall at maximum 16 inches o.c. vertically and 24 inches o.c. horizontally. Place at maximum 3 inches o.c. each way around perimeter of openings, within 12 inches of openings.

3.08 MASONRY FLASHINGS

A. Extend flashings horizontally at foundation walls, above ledge or shelf angles and lintels, under parapet caps, and at bottom of walls.
B. Turn flashing up minimum 8 inches and bed into mortar joint of masonry, seal to concrete, seal or underlap at sheathing over framed back-up.
C. Lap end joints minimum 6 inches and seal watertight.
D. Turn flashing, fold, and seal at corners, bends, and interruptions.

3.09 LINTELS

A. Install loose steel or precast concrete lintels over openings as indicated or detailed.
B. Maintain minimum 8 inch bearing on each side of opening.

3.10 ENGINEERED MASONRY

A. Lay masonry units with core cells vertically aligned and cavities between wythes clear of mortar and unobstructed.
B. Place mortar in masonry unit bed joints back 1/4 inch (6 mm) from edge of unit grout spaces, bevel back and upward. Permit mortar to cure 7 days before placing grout.
C. Reinforce masonry unit cores and cavities with reinforcement bars and grout as indicated.
D. Retain vertical reinforcement in position at top and bottom of cells and at intervals not exceeding 192 bar diameters. Splice reinforcement in accordance with Section 03200.
E. Wet masonry unit surfaces in contact with grout just prior to grout placement.
F. Grout spaces less than 2 inches in width with fine grout using low lift grouting techniques. Grout spaces 2 inches or greater in width with course grout using high or low lift grouting techniques.
G. When grouting is stopped for more than one hour, terminate grout 1-1/2 inch below top of upper masonry unit to form a positive key for subsequent grout placement.
H. Low Lift Grouting: Place first lift of grout to a height of 16 inches to three CMU courses and rod for grout consolidation. Place subsequent lifts in 8 inch increments and rod for grout consolidation.
I. High Lift Grouting:
    1. Provide cleanout opening no less than 4 inches high at the bottom of each cell to be grouted by cutting one face shell of masonry unit.
    2. In double wythe walls, omit every second masonry unit in one of the wythes for clean out and cell inspection purposes.
    3. In double wythe walls, construct vertical grout barriers or dams between the masonry wythes, with masonry units every 30 feet maximum.

4. Clean out masonry cells and cavities with high pressure water spray. Permit complete water drainage.
5. Request inspection of the cells and cavities. Allow 3 days advance notice of inspection.
6. After cleaning and cell inspection, seal openings with masonry units.
7. Pump grout into spaces. Maintain water content in grout to intended slump without aggregate segregation.
8. Limit grout lift to 60 inches and rod for grout consolidation or mechanically vibrate. Wait 60 minutes before placing next lift.

3.11 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control and expansion joints.
B. Form control joint with a sheet building paper bond breaker fitted to one side of the hollow contour end of the block unit. Fill the resultant core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.
C. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
D. Size control joint in accordance with Section 07900 for sealant performance.
E. Form expansion joint as detailed.

3.12 BUILT-IN WORK

A. As work progresses, install built-in metal door and glazed frames, fabricated metal frames, window frames, wood nailing strips, fireplace accessories, anchor bolts, plates, and other items to be built-in the work and furnished by other sections.
B. Install built-in items plumb and level.
C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.
D. Do not build in organic materials subject to deterioration.

3.13 TOLERANCES

A. Maximum Variation From Alignment of Columns: 1/4 inch.
B. Maximum Variation From Unit to Adjacent Unit: 1/32 inch.
C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
F. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.
G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.14 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, sleeves, and grounds. Coordinate with other sections of work to provide correct size, shape, and location.
B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.15 CLEANING

A. Remove excess mortar and mortar smears as work progresses.
B. Replace defective mortar. Match adjacent work.
C. Clean soiled surfaces with cleaning solution.
D. Use non-metallic tools in cleaning operations.

3.16 PROTECTION OF FINISHED WORK

A. Protect finished Work.
B. Without damaging completed work, provide protective boards at exposed external corners which may be damaged by construction activities.

END OF SECTION 04300

SECTION 044300

STONE 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 ACTION SUBMITTALS

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

1. For stone varieties proposed for use on Project, include test data indicating compliance with physical properties specified or required by referenced ASTM standards.

B. Samples for Initial Selection: For colored mortar and other items involving color selection.

C. Samples for Verification:

1. For each stone type indicated. Include at least **five** samples in each set for each type of stone, exhibiting extremes of the full range of color and other visual characteristics expected in completed Work. Samples will establish the standard by which stone provided will be judged.
2. For each color of mortar required. Label Samples to indicate types and amounts of pigments used.

1.3 INFORMATIONAL SUBMITTALS

A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, sources of supply, and other information as required to identify materials used. Include mix proportions for mortar and source of aggregates.

1. Submittal is for information only. Neither receipt of list nor approval of mockups constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

B. Qualification Data: For qualified Installer.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs experienced stonemasons and stone fitters.

B. Source Limitations for Stone: Obtain each variety of stone, regardless of finish, from one quarry, whether specified in this Section or in another Section of the Specifications, with resources to provide materials of consistent quality in appearance and physical properties.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

C. 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.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 PROJECT CONDITIONS

A. Protection of Stone Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed stone 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. Stain Prevention: Immediately remove mortar and soil to prevent them from staining the face of stone masonry.

1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on the ground and over the 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 end of each day to prevent rain from splashing mortar and dirt on completed stone masonry.

C. 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 stone masonry damaged by frost or 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 above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1.7 COORDINATION

A. Advise installers of other work about specific requirements for placement of reinforcement, veneer anchors, flashing, and similar items to be built into stone masonry.

PART 2 - PRODUCTS

2.1 STONE

A. Stone: Comply with ASTM C 568.

1. Products: Subject to compliance with requirements, stone varieties that may be incorporated into the Work include, but are not limited to, the following:

a. Arkansas Ledgerock/Ledgestone. Contact Keith Naegele 785-820-1333.

2. Description: Color/appearance, texture, height and random lengths to match existing. Submit samples for approval prior to bid.

2.2 MORTAR MATERIALS

A. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or III, and hydrated lime complying with ASTM C 207.

B. Masonry Cement: ASTM C 91.

C. 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.

a. Match existing mortar.

D. Latex Additive: Manufacturer's standard acrylic-resin or styrene-butadiene-rubber water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement mortar bed, and not containing a retarder.

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. Boiardi Products Corporation.
b. Bonsal.
c. Bostik Findley Inc.
d. C-Cure.
e. Custom Building Products.
f. DAP Inc.
g. Laticrete International, Inc.
h. MAPEI Corp.
i. Summitville Tiles, Inc.
j. TEC Specialty Construction Brands; H. B. Fuller Company.

E. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Euclid Chemical Company (The); Accelguard 80.
b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Morset.
c. Sonneborn, Div. of Degussa Building Systems; Trimix-NCA.

F. Water: Potable.

2.3 VENEER ANCHORS

A. Materials:

1. Hot-Dip Galvanized Steel Wire: ASTM A 82, with ASTM A 153/A 153M, Class B-2 580M.

B. Size: Sufficient to extend at least halfway, but not less than 1-1/2 inches, through stone masonry and with at least 5/8-inch cover on outside face.

C. Adjustable Wire Veneer Anchors at limestone-to-cmu veneer locations: Wire ties formed from 9 gage, hot-dip galvanized-steel wire similar to Hohmann & Barnard #270 Ladder Eye-Wire.

D. Adjustable, Screw-Attached Veneer Anchors: Units consisting of a wire tie section and a metal anchor section that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over rigid insulation board and sheathing to metal studs similar to Heckmann, Pos-I-Tie.

2.4 STONE TRIM ANCHORS

A. Stone Trim Anchors: Units fabricated with tabs or dowels designed to engage kerfs or holes in stone trim units and holes for fasteners or postinstalled anchor bolts for fastening to substrates or framing as indicated.

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. Halfen Anchoring Systems; Meadow Burke.
    b. Heckmann Building Products Inc.
    c. Hohmann & Barnard, Inc.

B. Materials: Fabricate anchors from stainless steel, ASTM A 240/A 240M, Type 304. Fabricate dowels from stainless steel, ASTM A 276, Type 304.

C. Fasteners for Stone Trim Anchors: Annealed stainless-steel bolts, nuts, and washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1.

D. Postinstalled Anchor Bolts for Fastening Stone Trim Anchors: Torque-controlled expansion anchors or undercut anchors made from stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.

2.5 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with SMACNA's "Architectural Sheet Metal Manual and as follows:

1. Copper: ASTM B 370, Temper H00 or H01, cold-rolled copper sheet, 10-oz./sq. ft. weight or 0.0135 inch thick for fully concealed flashing; 16-oz./sq. ft. weight or 0.0216 inch thick elsewhere.
2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
3. Fabricate through-wall metal flashing embedded in masonry from copper, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.

    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) Cheney Flashing Company; Cheney Flashing (Dovetail) or Cheney 3-Way Flashing (Sawtooth).
        2) Keystone Flashing Company, Inc.; Keystone 3-Way Interlocking Thruwall Flashing.

4. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
5. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.

6. Fabricate through-wall flashing with sealant stop unless otherwise indicated. Fabricate by bending metal back on itself 3/4 inch at exterior face of wall and down into joint 3/8 inch to form a stop for retaining sealant backer rod.
7. Fabricate metal drip edges and sealant stops for ribbed metal flashing from plain metal flashing of same metal as ribbed flashing and extending at least 3 inches into wall with hemmed inner edge to receive ribbed flashing and form a hooked seam. Form hem on upper surface of metal so that completed seam will shed water.
8. Metal Drip Edges: 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 and hemmed.
9. Metal Flashing Terminations: 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 3/8 inch to form a stop for retaining sealant backer rod.
10. Metal Expansion-Joint Strips: Fabricate from copper to shapes indicated.

B. Flexible Flashing: For flashing not exposed to the exterior, use the following unless otherwise indicated:

1. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D 4637, 0.040 inch thick.

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) Carlisle Coatings & Waterproofing; Pre-Kleened EPDM Thru-Wall Flashing.
2) Firestone Building Products; FlashGuard.
3) Heckmann Building Products Inc.; No. 81 EPDM Thru-Wall Flashing.

C. Solder and Sealants for Sheet Metal Flashings:

1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
2. Solder for Copper: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.
3. Elastomeric Sealant: ASTM C 920, chemically curing urethane sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

D. Adhesives, Primers, and Seam Tapes for Flexible Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.6 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane or PVC.

B. Cementitious Dampproofing: Cementitious formulations that are recommended by ILI and that are nonstaining to stone, compatible with joint sealants, and noncorrosive to veneer anchors and attachments.

C. Asphalt Dampproofing: Cut-back asphalt complying with ASTM D 4479, Type I or asphalt emulsion complying with ASTM D 1227, Type III or IV.

D. Weep Hole/Vent Products: Use[one of] the following unless otherwise indicated:

1. Wicking Material: Absorbent rope, made from cotton or UV-resistant synthetic fiber], 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 masonry. Use only for weep holes.
2. Round Plastic Tubing: Medium-density polyethylene, 3/8-inch OD by thickness of stone masonry.
3. Rectangular Plastic Tubing: Clear butyrate, 3/8 by 1-1/2 inches by thickness of stone masonry.
4. Mesh Weep Holes/Vents: Free-draining mesh; made from polyethylene strands, full width of head joint and 2 inches high by thickness of stone masonry; in color selected from manufacturer's standard.

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) CavClear/Archovations, Inc.; CavClear Weep Vents.
2) Mortar Net USA, Ltd.; Mortar Net Weep Vents.

5. Vinyl Weep Holes/Vents: One-piece, offset, T-shaped units made from flexible, injection-molded PVC, designed to fit into head joint and consisting of louvered vertical leg, flexible wings to seal against ends of stone units, and top flap to keep mortar out of head joint; in color approved by Architect to match that of mortar.

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) Hohmann & Barnard, Inc.; #343 Louvered Weep Hole.
2) Williams Products, Inc.; Williams-Goodco Brick Vent.
3) Wire-Bond; Louvered Weepholes.

E. 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 wide, with dovetail shaped notches 7 inches deep that prevent mesh from being clogged with mortar droppings.
b. Strips, not less than 3/4 inch thick and 10 inches wide, with dimpled surface designed to catch mortar droppings and prevent weep holes from being clogged with mortar.
c. Sheets or strips full depth of cavity and installed to full height of cavity.
d. Sheets or strips not less than 3/4 inch thick and installed to full height of cavity with additional strips 4 inches high at weep holes and thick enough to fill entire depth of cavity and prevent weep holes from being clogged with mortar.

2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Advanced Building Products Inc.; Mortar Break or Mortar Break II.
b. CavClear/Archovations, Inc.; CavClear Masonry Mat.
c. Dur-O-Wal, a Dayton Superior Company; Polytite MortarStop.
d. Mortar Net USA, Ltd.; Mortar Net.

F. Expanded Metal Lath: 3.4 lb/sq. yd., self-furring, diamond-mesh lath complying with ASTM C 847. Fabricate from structural-quality, zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G60.

G. Woven-Wire Lath: ASTM C 1032, fabricated into 1-1/2-inch hexagonal-shaped mesh with minimum 0.0510-inch- diameter, galvanized-steel wire.

H. Welded-Wire Lath: ASTM C 933, fabricated into 2-by-2-inch mesh with minimum 0.0625-inch-diameter, galvanized-steel wire.

I. Lath Attachment Devices: Material and type required by ASTM C 1063 for installations indicated.

2.7 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar and grout stains, efflorescence, and other new construction stains from stone masonry surfaces without discoloring or damaging masonry surfaces; expressly approved for intended use by cleaner manufacturer and stone producer.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Diedrich Technologies, Inc.
    b. Dominion Restoration Products.
    c. EaCo Chem, Inc.
    d. Hydrochemical Techniques, Inc.
    e. Prosoco, Inc.

2.8 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. Limit cementitious materials in mortar to portland cement, mortar cement, and lime.
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.
4. 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. 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 Stone Masonry: Comply with ASTM C 270, Specification.

1. Mortar for Setting Stone: Type S.
2. Mortar for Pointing Stone: Type N.

D. Mortar color and joint style must match existing.

2.9 FABRICATION

A. Fabricate stone to comply with sizes, shapes, and tolerances recommended by applicable stone association or, if none, by stone source, for faces, edges, beds, and backs.
1. For limestone, comply with recommendations in ILI's "Indiana Limestone Handbook."

B. Cut stone to produce pieces of thickness, size, and shape indicated, including details on Drawings. Dress joints (bed and vertical) straight and at right angle to face unless otherwise indicated.

C. Cut and drill sinkages and holes in stone for anchors and supports.

D. Carefully inspect stone at quarry or fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units before shipment.

1. Clean sawed backs of stone to remove rust stains and iron particles.

E. Gage backs of stones for adhered veneer if more than 81 sq. in. (522 sq. cm) in area.

F. Thickness of stone to match existing.

G. Shape stone to match existing.

H. Finish exposed faces and edges of stone to match existing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces indicated to receive stone masonry, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine substrate to verify that dovetail slots, inserts, reinforcement, veneer anchors, flashing, and other items installed in substrates and required for or extending into stone masonry are correctly installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Accurately mark stud centerlines on face of weather-resistant sheathing paper before beginning stone installation.

B. Coat concrete and unit masonry backup with asphalt dampproofing.

C. Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

3.3 SETTING OF STONE MASONRY, GENERAL

A. Perform necessary field cutting and trimming as stone is set.

1. Use power saws to cut stone that is fabricated with saw-cut surfaces. Cut lines straight and true, with edges eased slightly to prevent snipping.
2. Use hammer and chisel to split stone that is fabricated with split surfaces. Make edges straight and true, matching similar surfaces that were shop or quarry fabricated.
3. Pitch face at field-split edges as needed to match stones that are not field split.

B. Sort stone before it is placed in wall to remove stone that does not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that is otherwise unsuitable for intended use.

C. Arrange stones in course heights to match existing. Length shall be ramdom. All joints shall match existing.

D. Arrange stones with color and size variations uniformly dispersed for an evenly blended appearance.

E. Set stone to comply with requirements indicated on Drawings. Install supports, fasteners, and other attachments indicated or necessary to secure stone masonry in place. Set stone accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.

F. 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 or more than 1/2 inch at widest points.

G. Provide sealant joints of widths and at locations indicated.

1. Keep sealant joints free of mortar and other rigid materials.
2. Sealing joints is specified in Section 079200 "Joint Sealants."

H. Install metal expansion strips in sealant joints at locations indicated. Build flanges of expansion strips into masonry by embedding in mortar between stone masonry and backup wythe. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.

I. 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 stud-framed walls, extend flashing through stone masonry, up the face of sheathing at least 12 inches, and behind weather-resistant sheathing paper.
2. At multiwythe masonry walls, including cavity walls, extend flashing through stone masonry, turned up a minimum of 8 inches, and extend into or through inner wythe to comply with requirements in Section 04200 "Unit Masonry."
3. At concrete backing, extend flashing through stone masonry, turned up a minimum of 8 inches, and insert in reglet.
4. At lintels and shelf angles, extend flashing full length of angles but not less than 6 inches into masonry at each end.
5. At sills, extend flashing not less than 4 inches at ends.
6. At ends of head and sill flashing turn up not less than 2 inches to form end dams.
7. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 07900 "Joint Sealants" for application indicated.
8. Install metal drip edges and sealant stops with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
9. Extend sheet metal flashing 1/2 inch beyond face of masonry at exterior and turn flashing down to form a drip.
10. 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.
11. 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.
12. Cut flexible flashing flush with face of wall after masonry wall construction is completed.

J. Coat stone with cementitious 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.
3. Allow cementitious dampproofing formulations to cure before setting dampproofed stone. Do not damage or remove dampproofing in the course of handling and setting stone.

K. Place weep holes and vents in joints where moisture may accumulate, including at base of cavity walls, above shelf angles, and at flashing.

1. Use mesh weep holes/vents to form weep holes.
2. 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.
3. Space weep holes 24 inches o.c.
4. Space weep holes formed from wicking material 16 inches o.c.
5. Trim wicking material used in weep holes flush with outside face of wall after mortar has set.
6. Place pea gravel in cavities as soon as practical to a height of not less than 2 inches above top of flashing, to maintain drainage.
7. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

L. Install vents in vertical head joints at the top of each continuous cavity at spacing indicated. Use mesh weep holes/vents 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.

3.4 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch in 40 feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 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.

D. Measure variation from level, plumb, and position shown in plan as variation of the average plane of the face of each stone from level, plumb, or dimensioned plane.

E. Variation in Mortar-Joint Thickness: Do not vary from joint size range indicated.

F. Variation in Plane between Adjacent Stones: Do not exceed one-half of tolerance specified for thickness of stone.

3.5 INSTALLATION OF ANCHORED STONE MASONRY

A. Anchor stone masonry to concrete with corrugated-metal veneer anchors unless otherwise indicated. Secure anchors by inserting dovetailed ends into dovetail slots in concrete.

B. Anchor stone masonry to unit masonry with wire anchors unless otherwise indicated. Connect anchors to masonry joint reinforcement by inserting pintles into eyes of masonry joint reinforcement projecting from unit masonry.

C. Anchor stone masonry to unit masonry with wire anchors unless otherwise indicated. Connect anchors to masonry joint reinforcement with vertical rods inserted through anchors and through eyes of masonry joint reinforcement projecting from unit masonry.

D. Anchor stone masonry to stud framing with adjustable, screw-attached veneer anchors unless otherwise indicated. Fasten anchors through sheathing to framing.

E. Embed veneer anchors in mortar joints of stone masonry at least halfway, but not less than 1-1/2 inches, through stone masonry and with at least 5/8-inch cover on outside face.

1. Install continuous wire reinforcement in horizontal joints and attach to seismic veneer anchors as stone is set.

F. Space anchors not more than 16 inches o.c. horizontally and 24 inches o.c. vertically. Install additional anchors within 12 inches of openings, sealant joints, and perimeter at intervals not exceeding 12 inches.

G. Anchor stone trim with stone trim anchors where indicated. Install anchors by fastening to substrate and inserting tabs and dowels into kerfs and holes in stone units. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with mortar.

H. Set stone in full bed of mortar with full head joints unless otherwise indicated. Build anchors into mortar joints as stone is set.

I. Provide 1-inch minimum cavity between stone masonry and backup construction unless otherwise indicated. Keep cavity free of mortar droppings and debris.

1. Place mortar spots in cavity at veneer anchors to maintain spacing.
2. Slope beds toward cavity to minimize mortar protrusions into cavity.
3. Do not attempt to trowel or remove mortar fins protruding into cavity.

J. Rake out joints for pointing with mortar to depth of not less than 1/2 inch before setting mortar has hardened. Rake joints to uniform depths with square bottoms and clean sides.

3.6 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 (10 mm) 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: match existing.

3.7 ADJUSTING AND CLEANING

A. Remove and replace stone masonry of the following description:

1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
2. Defective joints.
3. Stone masonry not matching approved samples and mockups.
4. Stone masonry not complying with other requirements indicated.

B. Replace in a manner that results in stone masonry matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean stone masonry as work progresses. Remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean stone masonry 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. Obtain Architect's approval of sample cleaning before cleaning stone masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water before applying cleaner; remove cleaner promptly by rinsing thoroughly with clear water.
5. Clean stone masonry by bucket and brush hand-cleaning method described in BIA Technical Note No. 20 Revised II, using job-mixed detergent solution.
6. Clean stone masonry with proprietary acidic cleaner applied according to manufacturer's written instructions.
7. Clean limestone masonry to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.8 EXCESS MATERIALS AND WASTE

A. Excess Stone: Stack excess stone where directed by Owner for Owner's use.

B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other waste, and legally dispose of off Owner's property.

END OF SECTION 044300

SECTION 054000

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Interior non-load-bearing wall framing.
   2. Exterior non-load-bearing wall framing.

B. Related Sections include the following:
   1. Division 09 Section “Gypsum Board Assemblies” for interior non-load-bearing, metal-stud-framed assemblies.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

   1. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
      a. Upward and downward movement of **1 inch.**

B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."

   1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
   2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.4 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

B. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

C. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:
1. Allied Studco.
2. AllSteel Products, Inc.
3. California Expanded Metal Products Company.
4. Clark Steel Framing.
5. Consolidated Fabricators Corp.; Building Products Division.
6. Craco Metals Manufacturing, LLC.
7. Custom Stud, Inc.
8. Dale/Incor.
9. Design Shapes in Steel.
10. Dietrich Metal Framing; a Worthington Industries Company.
11. Formetal Co. Inc. (The).
12. Innovative Steel Systems.
13. MarinoWare; a division of Ware Industries.
14. Quail Run Building Materials, Inc.
15. SCAFCO Corporation.
16. Southeastern Stud & Components, Inc.
17. Steel Construction Systems.
18. Steeler, Inc.
19. Super Stud Building Products, Inc.
20. United Metal Products, Inc.

2.2 MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
1. Grade: 70 KSI.
2. Coating: **G60**.

B. Steel Sheet for **Vertical Deflection** Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: **70, Class 1 or 2**.
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 (unless noted otherwise on Structural Drawings):

1. Minimum Base-Metal Thickness: **0.0538 inch**.
2. Flange Width: **2 inches**.

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: As indicated on Structural Drawings. 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. Minimum Base-Metal Thickness: As noted on Design Drawings.
2. Flange Width: **1-5/8 inches**.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: **Matching steel studs**.
2. Flange Width: **1-1/4 inches**.

C. Vertical Deflection Clips: Manufacturer's standard **bypass** clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
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. Dietrich Metal Framing; a Worthington Industries Company.
   b. MarinoWare, a division of Ware Industries.
   c. SCAFCO Corporation
   d. The Steel Network, Inc.

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 and lateral loads and transfer them to the primary structure, and as follows:
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. Minimum Base-Metal Thickness: **0.0428 inch**.
3. Flange Width: 2 ½”.

2.5 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

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

11. Backer plates.

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 headless, hooked bolts** and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by **mechanically deposition according to ASTM B 695, Class 50**.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: 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.

F. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: **ASTM A 780**.

B. Cement Grout: Portland cement, ASTM C 150, 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: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

D. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

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.

2.8 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
   a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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 are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.
1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
    a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
   1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 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. Connect vertical deflection clips to **bypassing** studs and anchor to building structure.
   2. 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.

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 **96-inch centers maximum or 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 INTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to bottom track, unless otherwise indicated. Space studs as follows:
   1. Stud Spacing: **16 inches**.

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-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.

E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
   1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within **12 inches** of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
      a. Install solid blocking at **96-inch centers.**
   2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
   3. 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.
   4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

G. Brace stud framing system rigid. Stud profile and size shall be as required for wall height and bracing limitations. **Interior walls shall meet the IBC 2012 requirement for minimum 5 psf horizontal loading**. Installation, bracing, stiffening, of all stud wall systems shall be as required by stud manufacturer's published and/or specifically engineered data. Acoustical ceilings are not an approved method of bracing.

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. Remove and replace work where test results indicate that it does not comply with specified requirements.

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 metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, which ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

3.7 SCHEDULE

A. 20 gage at all metal studs (3 5/8", 4" and 6").

END OF SECTION 054000

SECTION 05520

HANDRAILS AND RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Steel pipe handrails, balusters, and fittings.

1.02 DESIGN REQUIREMENTS
A. Railing assembly, wall rails, and attachments to resist lateral force of 250 lbs. at any point without damage or permanent set.

1.03 SUBMITTALS
A. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1.04 FIELD MEASUREMENTS
A. Verify that field measurements are as indicated on shop drawings.

PART 2 PRODUCTS

2.01 STEEL RAILING SYSTEM
A. Rails and Posts: As detailed and indicated on the drawings.
B. Fittings: Elbows, T-shapes, wall brackets, escutcheons; machined steel.
C. Mounting: Adjustable brackets and flanges, with steel inserts for casting in concrete and/or steel brackets for embedding in masonry. Prepare backing plate for mounting in wall construction.
D. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.
E. Splice Connectors: Steel concealed spigots, welding collars.
F. **Architectural Screen Material at Stairs: McNichols, Designer Metal, Moire 1/8”x3/4” design, 3/16” thick, powder coat.**

2.02 FABRICATION
A. Fit and shop assemble components in largest practical sizes, for delivery to site.
B. Fabricate components with joints tightly fitted and secured.
C. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
E. Continuously seal joined pieces by continuous welds.
F. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
G. Accurately form components to suit stairs and landings, to each other and to building structure.
H. All exterior handrails and railings shall be galvanized and painted.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify that field conditions are acceptable and are ready to receive work.
B. Beginning of installation means erector accepts existing conditions.

3.02 PREPARATION
A. Clean and strip primed steel items to bare metal where site welding is required.
B. Supply items required to be cast into concrete and/or embedded in masonry, placed in partitions with setting templates, to appropriate Sections.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Install components plumb and level, accurately fitted, free from distortion or defects.
C. Provide anchors, plates angles required for connecting railings to structure. Anchor railing to structure.
D. Field weld anchors as indicated on Drawings. Touch-up welds with primer. Grind welds smooth.
E. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 ERECTION TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION 05520

SECTION 06112

SHEATHING

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Gypsum wall sheathing.
- B. Plywood telephone and electrical panel boards.

1.02 DELIVERY, STORAGE, AND HANDLING
- A. Deliver, store, protect, and handle products to site under provisions of the General Requirements.
- B. Protect sheathing from warping or other distortion by stacking.

PART 2 PRODUCTS

2.01 SHEATHING MATERIALS
- A. Gypsum Wall Sheathing: Fire resistant, 5/8 inch, glass mat, Type "x" core.
  1. Manufacturer – Georgia Pacific Dens Glass Gold.
- B. Cement Board (at west entry fascade): 1/2 inch.
  1. Manufacturer – USG, Durock.

2.02 ACCESSORIES
- A. Fasteners and Anchors:
  1. Fasteners: Hot-dipped galvanized steel for high humidity and treated wood locations including exterior walls, roof areas, and 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. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolt or ballistic fastener for anchorages to steel.
- B. Building Paper: Commercial Grade Tyvek at exterior walls.

PART 3 EXECUTION

3.01 FRAMING
- A. Set structural members level and plumb, in correct position.
- B. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- C. Place horizontal members flat, crown side up.
- D. Construct load bearing framing and curb members full length without splices.
- E. Place full width continuous sill flashings under framed walls on cementitious foundations. Lap flashing joint 4 inches.
- F. Place sill gasket directly on sill flashing. Puncture gasket clean and fit tight to protruding foundation anchor bolts.

3.02 SHEATHING
- A. Secure wall sheathing with long dimension perpendicular to wall studs, with ends over firm bearing and staggered.
- B. Place fluid applied air barrier over wall sheathing as per manufacturer's direction.
- C. Install telephone and electrical panel boards with plywood sheathing material where required. Over size the panel by 12 on all sides.

3.03 TOLERANCES
- A. Framing Members: 1/4 inch from true position, maximum.
- B. Surface Flatness of Floor: 1/4 inch in 10 feet maximum, and 1/2 inch maximum in 30 feet.

END OF SECTION 06112

SECTION 06114

WOOD BLOCKING AND CURBING

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Blocking in wall and roof openings.
- B. Wood furring and grounds.
- C. Concealed wood blocking for support of toilet and bath accessories, wall cabinets.

PART 2 PRODUCTS

2.01 MATERIALS
- A. Miscellaneous Blocking: Minimum stud grade, fire retardant treated.
- B. Plywood: APA Rated Sheathing, Grade C-D; Exposure Durability 1; sanded, Fire Retardant Treated.
- C. Roof Curbs and Cants: CCA - Treated lumber.

2.02 ACCESSORIES
- A. Fasteners and Anchors:
  1. Fasteners: Hot-dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.
  2. Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolt or ballistic fastener for anchorages to steel.

PART 3 EXECUTION

3.01 FRAMING
- A. Set members level and plumb, in correct position.
- B. Place horizontal members flat, crown side up.
- C. Construct curb members of single pieces.
- D. Space framing and furring 16 inches o.c.
- E. Curb roof openings except where prefabricated curbs are provided. Form corners by alternating lapping side members.
- F. Coordinate curb installation with installation of decking and support of deck openings, roofing vapor retardant, parapet construction.

END OF SECTION 06114

SECTION 06200

FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Finish carpentry items, other than shop prefabricated casework.
- B. Hardware and attachment accessories.

1.02 QUALITY ASSURANCE
- A. Perform work in accordance with AWI Custom.

1.03 DELIVERY, STORAGE, AND HANDLING
- A. Deliver, store, protect and handle products to site under provisions of the General Requirements.
- B. Protect work from moisture damage.

1.04 FIELD MEASUREMENTS
- A. Verify that field measurements are as indicated on shop drawings and as instructed by the manufacturer.

1.05 COORDINATION
- A. Coordinate the work with plumbing and electrical rough-in, and installation of associated and adjacent components.

PART 2 PRODUCTS

2.01 SHEET MATERIALS
- A. Plastic Laminate over High Performance Particleboard Core: Particleboard to be ¾" thick of 45 lb. Density, and balanced construction with moisture content not to exceed 8%. All particleboards shall meet or exceed the requirements for its type and classification under Commercial Standard CS-236-66, Federal Specifications LLL-B-800A, and ASTM D 1037-78.

2.02 FASTENERS
- A. Fasteners: Of size and type to suit application; Galvanized finish in concealed locations and Brass or Chrome finish in exposed locations.

2.03 FABRICATION
- A. Fabricate to AWI Custom standards.
- B. Shop assemble work for delivery to site, permitting passage through building openings.
- C. Fit exposed sheet material edges with full thickness matching plastic laminate.
- D. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.04 SHOP FINISHING
- A. Sand work smooth and set exposed nails and screws.
- B. Apply wood filler in exposed nail and screw indentations.
- C. On items to receive transparent finishes, use wood filler which matches surrounding surfaces and of types recommended for applied finishes.
- D. Seal, stain and varnish exposed to view surfaces. Brush apply only.
- E. Prime paint. Seal surfaces in contact with cementitious materials.

PART 3 EXECUTION

3.01 EXAMINATION
- A. Verify adequacy of backing and support framing.
- B. 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 Custom Quality Standard.
B. Set and secure materials and components in place, plumb and level.
C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.
D. Install components trim with nails, screws, bolts with blind fasteners or wall adhesive by gun application.
E. Install hardware in accordance with manufacturer's instructions.

3.03 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment in accordance with manufacturer's instructions.
B. Brush apply two coats of preservative treatment on wood in contact with cementitious materials, roofing and related metal flashings. Treat site-sawn cuts.
C. Allow preservative to dry prior to erecting members.

3.04 PREPARATION FOR SITE FINISHING

A. Site Finishing: Refer to Section 09900.
B. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.05 SCHEDULE

A. Interior:
   1. **Low wall cap at Rooms #101 and #304: Plastic laminate over ¾" thick high density particle board. Colors and textures as selected from manufacturer's full line as per Section 06410.**

END OF SECTION 06200

SECTION 06410

CUSTOM CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Countertops, base and wall cabinets.
- B. Cabinet hardware.
- C. Prefinished surfaces.
- D. Preparation for installing utilities.

1.02 SUBMITTALS
- A. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location, and schedule of finishes.

1.03 QUALIFICATIONS
- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years' documented experience.

1.04 DELIVERY, STORAGE, AND HANDLING
- A. Deliver, store and handle products to site.
- B. Protect units from moisture damage.

1.05 FIELD MEASUREMENTS
- A. Verify that field measurements are as on shop drawings.

1.06 COORDINATION
- A. Coordinate the work with plumbing and electrical rough-in.

PART 2 PRODUCTS

2.01 MANUFACTURERS
- A. Timberline Cabinetry (Manhattan)
- B. Salina Planing Mill (Salina)
- C. Cabinetry & Millwork Concepts (Topeka)
- D. Wend-Wood (Wichita)
- E. Kitchens Inc. (Dodge City)
- F. TMI (North Dakota)
- G. Substitutions: Under provisions of the General Requirements.

2.02 WOOD MATERIALS
- A. Hardwood Lumber: FS MM-L-736; graded in accordance with AWI Premium; average moisture content of 6 percent; species and grade as follows:

ITEM	SPECIES
Exposed Trim and Mouldings	Plain Sliced Red Oak or Plastic Laminate
Internal Construction	Melamine Faced panels at Plastic Laminated Cabinets, or faced wood to match at other locations per AWI premium grade standards

2.03 SHEET MATERIALS
- A. Hardwood Plywood: S 51; graded in accordance with AWI, core materials of veneer, and lumber, type of glue recommended for application; face veneer and cuts as follows:

ITEM	FACE SPECIES
Drawer Construction	per AWI, Plastic Laminate and Hardwood
Gables and Backs	per AWI, Plastic Laminate and Hardwood

- B. High Performance particleboard Core:
  1. Particleboard to be ¾" thick of 45 lb. Density, and balanced construction with moisture

Content not to exceed 8%. All particleboards shall meet or exceed the requirements for its type and classification under Commercial Standard CS-236-66, Federal Specifications LLL-B-800A, and ASTM D 1037-78.

2. Particleboard shall meet the following performance requirements. Submit compliance data from the manufacturer prior to fabrication:

Screw Holding, Face	471 lbs.
Modulus of Rupture	2,400 psi.
Modulus of Elasticity	450,000 psi.
Internal Bond	90 psi.
Surface Hardness	900 lbs.

C. Hardboard: Hardboard shall meet or exceed Commercial Standards CS-251 and Federal Specifications LLL-B-00810. Tempered hardboard ¼" thick, smooth both sides.

2.04 MANUFACTURERS - PLASTIC LAMINATE

A. Wilsonart – Full Line.
B. Formica – Full Line.
C. Pionite – Full Line.
D. Nevamar – Full Line.
E. Substitutions: Under provisions of the General Requirements.

2.05 LAMINATE MATERIALS

A. Plastic Laminate: AWI, 0.048 inch General Purpose quality V32 grade; color, pattern, and surface texture as selected from "premium" color range, shall meet NEMA standards for vertical grade.
B. Laminate Backing Sheet: 0.020 inch Backing Sheet grade, undecorated plastic laminate shall meet NEMA standards and be of a type and thickness to properly balance face finish.
C. Countertop high pressure plastic laminate:
   1. High-pressure plastic laminate, satin finish, .048" thickness. Color as selected from manufacturer's full line.
   2. Heavy gauge, neutral-colored backing sheet for balanced construction.
   3. Tops to be 1" thick with 4" backsplash.
   4. Edges to be .048" full thickness laminate.
   5. Provide moisture resistant substrate at all counter tops in which sinks occur.
D. Melamine Laminate (white):
   1. Thermosetting melamine laminate, permanently bonded to substrate.
   2. Melamine laminate to be 9 to 11 mills in thickness, 62% resin content, colorfast and neutral in color: white.
   3. Colored melamine laminate for semi-exposed cabinet interiors behind doors and drawers, and underside of wall cabinets.

2.06 QUARTZ SURFACES – COUNTERTOP AND BACKSPLASH

A. Quartz Surfaces: Surfaces of Zodiaq® shall be manufactured by DuPont.
B. Color to be selected from pricing category "5".
C. Zodiaq® sheets will be 3/4-inch (2cm) for horizontal applications and shall have thickened edges as noted on drawings. Eased outside edges. Backsplashes shall be ¾ inch (2cm) with eased top edges.
D. Sheets are available in a standard size of 52 inches x 118 inches (1.3m x 3m).
E. Physical properties shall conform to the manufacturer's standard specifications.
F. The materials shall not be coated or laminated.
G. Installation shall be by a qualified and experienced installer in a professional manner, in accordance with the manufacturer's instructions.
H. Reference drawings for locations of quartz.

2.07 SOLID SURFACE COUNTERTOPS AND BACKSPLASH MATERIALS

1. Wilsonart Solid Surface – 1/2 inch standard thickness with 1 inch thick front eased edges. Color to be selected from pricing category "5".

2.08 ACCESSORIES

A. Adhesive: FS MMM-A-130 contact adhesive, type recommended by AWI and laminate manufacturer to suit application.
B. Fasteners: Size and type to suit application.
C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; approved finish in exposed locations.

D. Concealed Joint Fasteners: Threaded steel.
E. **Tack Surface: Claridge, Designer Series, #3102EW, full range of colors.**

2.09 HARDWARE
A. Hinges:
1. At all locations unless noted otherwise: Blum #71B3508B Clip Top BluMotion; 110° operation; Quiet close type.
2. At entire third floor cabinetry: 2 ¾ inch, 5-knuckle steel hinges with hospital tips equal to Rockford Process Control #376. Finish to be selected by Owner from manufacturer's full line.
B. Pulls: Standard manufacturer's 3" wire pull. Owner to select from manufacturer's full line of finishes.
C. Drawer Slides: Tandum Plus BluMotion #563; Supplier verify maximum length allowable at cabinet.
D. Adjustable shelf clips: Knape & Vogt, 3256 zinc Finish.
E. Cushion Bumpers: Hafele #356.21.428 – clear. Two on each door and drawer.
F. "Recessed" Adjustable shelf standards: Knape & Vogt, #255, zinc finish.
G. Grommets: Hafele, Series #429, full range colors. Quantity (2). Locate per shop drawings review.
H. Countertop Supports: A&M Hardware, Inc. Must meet ADA. Submit for approval. Color: Black.
I. Locks (at Check-In/Reception #102 only): To be disc tumbler lock, cam type, master-keyed. Submit for approval.

2.10 FABRICATION
A. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.
B. When necessary to cut and fit on site, and on existing casework to be field cut, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
C. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
D. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
E. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, fixtures and fittings. Verify locations of cutouts from on-site dimensions. Seal contact surfaces of cut edges.
F. Cabinet Subbase: To be separate and continuous (no cabinet body sides-to-floor), waterproof plywood with concealed fastening to cabinet bottom. Ladder-type construction of front, back and intermediates, to form a secure and level platform to which cabinets attach.
G. Cabinet Top and Bottom - Wall and Base:
1. Base cabinet bottoms to be colored polyester-laminated particle board interior, 3/4" thick with phenolic neutral-colored backer sheet on a concealed side.
2. Solid sub-top to be 3/4" colored, furnished for all base cabinets.
3. Wall cabinet, bottoms and tops are 1" thick.
4. Exterior exposed wall cabinet bottoms to be colored polyester-laminate both sides. Assembly devices to be concealed on bottom side of wall cabinets.
5. Exposed edges to be color-matched and plastic laminate. **Tape not allowed.**
H. Cabinet Ends:
1. Colored polyester-laminated particleboard interior side, 3/4" thick with phenolic neutral-colored backer sheet on concealed side. Holes drilled for adjustable shelves 1-1/4" on center.
2. Exposed exterior cabinet ends to be laminated with plastic laminate.
3. Exposed edges to be color-matched plastic laminate. **Tape not allowed.**
I. Fixed and Adjustable Shelves:
1. Exposed Shelves: Colored plastic laminated particleboard two sides. All exposed edges of shelves to be edged with full thickness plastic laminate.
1. Unexposed Shelves: Black colored melamine particleboard two sides. All exposed edges of shelves to be edged with matching black tape.
2. Thickness: 3/4" standard shelving to 32" wide. One inch shelving 32" wide and over.
3. Instrument storage shelves to be 3/4" thick consisting of 1/8" tempered hardboard, laminated to top and bottom of 1/2" particleboard core. Front leading edges rabbeted to receive 3/4" x 3/4" extruded metal edge.
4. Shelving shall be capable of supporting textbooks and shall not span greater than 3 feet without an intermediate support.

J. Cabinet Backs:
1. Standard cabinet back to be 1/4" thick, prefinished to match interior for use on all cabinets, with or without doors. Rear, unexposed, side of back to receive continuous hot melt glue at joint between back and sides/top/bottom for sealing against moisture and vermin, and further contribute to case rigidity. Rails shall be ¾" x 3". Backs shall be ¼" thickness, same material as sides, bottoms, and shelves with ¾" x 3" blocking behind back @ 24" o.c. on cabinets over 36" tall. Casework fabricator to show backing requirements on shop drawings.
2. Exposed exterior backs to be 3/4" particleboard, faced with high pressure plastic laminate.

K. Doors and Drawer Fronts:
1. Plastic-laminated doors and drawer fronts (both sides) to be 13/16" thick for all hinged and sliding doors Core material to be 3/4" thick, 45 lb. density particleboard, bonded on exterior and interior face with high pressure laminate. Drawer fronts and hinged doors are to overlay the cabinet body. Maintain a maximum 1/8" reveal between pairs of doors, between door and drawer front, or between multiple drawer fronts within the cabinet.
2. Exposed edges to be color-matched plastic laminate. **Tape not allowed.**

L. Drawers:
1. Drawer fronts shall be applied to separate drawer body component sub-front.
2. Sides and back of drawers to be 1/2" thick solid lumber; sub-front same, to be 5/8" thick.
3. Use dovetail construction for joining sides to back and sub-front.
4. Drawer sides, back and sub-front shall be dadoed to receive drawer bottom.
5. Drawer bottom to be 1/4" hardboard or neutral-color polyester-laminate 1/4" thick. Drawer bottom to be machine squared and glued to sides, back and sub-front under pressure while pinned together. Reinforce drawer bottoms as required with intermediate spreaders.
6. Paper storage drawers fitted with hood at back.
7. All drawers shall have roller guides as specified under Paragraph 2.08.

M. Vertical and Horizontal Dividers: One of the following as indicated by cabinet number:
1. Tempered hardboard, 1/4" thick, smooth both faces. Secured in cabinet with molded plastic clips.
2. Neutral-colored polyester-laminated particle board 3/4" thickness. Secured in cabinet with molded plastic clips or dowels. Front edge to be FlatEdge 3mm PVC, neutral in color.

N. Door/Drawer Spreaders: Provide minimum 3/4" x 6" x full width cabinet body spreaders immediately behind all door/drawer and multiple drawer horizontal joints to maintain exact body dimensions, and close off reveal.

O. Countertops:
1. High-pressure plastic laminate, bonded to particleboard core. Underside to be properly balanced with heavy gauge backing sheet. Provide continuous tops for counter-type cabinets fixed in a line. Reinforce as required for occasional seating on the countertop.
2. ¾ inch quartz with thickened edges as per drawings.
3. ½ inch solid surface with thickened edges as per drawings.

P. Backsplashes: ¾ inch thick x height as per drawings.

2.11 FINISHING
A. Sand work smooth and set exposed nails and screws.
B. Apply wood filler in exposed nail and screw indentations.
C. On items to receive transparent finishes, use wood filler which matches surrounding surfaces and of types recommended for applied finishes.
D. Seal, stain and varnish exposed to view surfaces. Brush apply only.
E. Seal, stain and varnish internal exposed to view and semi-concealed surfaces. Brush apply only.
F. Seal surfaces in contact with cementitious materials.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify adequacy of backing and support framing.

3.02 INSTALLATION
A. Set and secure casework in place; rigid, plumb, and level.
B. Use fixture attachments in concealed locations for wall mounted components.
C. Use concealed joint fasteners to align and secure adjoining cabinet units and counter tops.
D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
E. Secure cabinet and counter bases to floor using appropriate angles and anchorages.

F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

G. Installation shall be in accordance with the requirements of the AWI Quality Standards for "Custom Grade" installation, Section 1700, latest edition.

3.03 ADJUSTING

A. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings and fixtures.

END OF SECTION 06410

SECTION 07110

SHEET MEMBRANE WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Adhesive applied elastomeric sheet membrane waterproofing.
- B. Cant strips.
- C. Flexible flashing around exterior windows.

1.02 REFERENCES
- A. ASTM D412 - Rubber Properties in Tension.
- B. ASTM D624 - Rubber Property - Tear Resistance.
- C. ANSI/ASTM D746 - Brittleness Temperature of Plastics and Elastomers by Impact.
- D. ASTM E96 - Water Vapor Transmission of Materials.

1.03 SYSTEM DESCRIPTION
- A. Waterproofing System: Capable of resisting water head of 15 feet and preventing moisture migration to interior.

1.04 SUBMITTALS
- A. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.
- B. Product Data: Provide data for surface conditioner, flexible flashings, joint cover sheet, and joint and crack sealants, with temperature range for application of waterproofing membrane.
- C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.05 QUALIFICATIONS
- A. Membrane Manufacturer: Company specializing in waterproofing sheet membranes with three years experience.
- B. Applicator: Company specializing in performing the work of this Section with minimum two years documented experience and approved by manufacturer.

1.06 ENVIRONMENTAL REQUIREMENTS
- A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until liquid or mastic accessories have cured or as required by the manufacturer.

1.07 WARRANTY
- A. Provide three year warranty under provisions of the General Requirements.
- B. Warranty: Include coverage for waterproofing failing to resist penetration of water, except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change of shrinkage is not considered a structural failure.
- C. For warranty repair work, be responsible for removing and replacing materials concealing waterproofing.

PART 2 PRODUCTS

2.01 MANUFACTURERS
- A. Grace.
- B. Substitutions: Under provisions of the General Requirements.

2.02 MEMBRANE MATERIALS
- A. Membrane: MEL ROL 56 mils thick; polymeric membrane by Grace, non-asphaltic.

2.03 ADHESIVE MATERIALS
- A. As recommended by manufacturer, compatible with sheet membrane.
- B. Elastomeric Mastic: 200 lin. ft. per gal.

C. Liquid Membrane: 135 lin. ft. per gal.
D. Thinner and Cleaner: As recommended by manufacturer, compatible with sheet membrane.

2.04 ATTACHMENT MATERIALS
A. Battens, Disc Washers and Screws, Circular Membrane Discs, and Reglet Strip Devices: All as recommended by the manufacturer.

2.05 ACCESSORIES
A. Sealant: As recommended by membrane manufacturer.
B. Cant Strips and Flexible Flashings: As recommended by manufacturer.
C. Counter Flashings: As recommended by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.
B. Verify items which penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION
A. Protect adjacent surfaces not designated to receive waterproofing.
B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions.
C. Do not apply waterproofing to surfaces unacceptable to manufacturer or applicator.
D. Seal cracks and joints with sealant materials using depth to width ratio as recommended by sealant manufacturer.
E. Apply surface conditioner at a rate recommended by manufacturer. Protect conditioner from rain or frost until dry.

3.03 INSTALLATION - ADHESIVE BONDED
A. Install membrane waterproofing in accordance with manufacturer's instructions.
B. Roll out membrane. Minimize wrinkles and bubbles.
C. Apply adhesive in accordance with manufacturer's instructions. Bond sheet to substrate.
D. Lap sides and ends in accordance with membrane manufacturer's instructions.
E. Overlap edges and ends and seal with contact adhesive minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
F. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or moving.
G. Weatherlap joints on sloped substrate in direction of drainage. Seal joints and seams. Coordinate with drain installation.
H. Install flexible flashings. Seal watertight to membrane.
I. Seal membrane and flashings to adjoining surfaces.
J. Extend membrane up cant strips and minimum of 6 inches onto vertical surfaces.
K. Seal items penetrating membrane and install counter flashing membrane material.

3.04 PROTECTION OF FINISHED WORK
A. Protect finished Work.
B. Do not permit traffic over unprotected or uncovered membrane.
C. Protect membrane from damage by adhering protection board, applied with mastic over membrane surface. Scribe and cut boards around projections and interruptions.

END OF SECTION 07110

SECTION 07213

BATT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Batt insulation at exterior walls.
- B. Batt insulation for filling perimeter window and door shim spaces, crevices in exterior wall and roof.
- C. Sound batt insulation.
- D. Vapor retarder.

1.02 REFERENCES
- A. ASTM C665 - Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- B. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
- C. ASTM E136

1.03 SYSTEM DESCRIPTION
- A. Materials of This Section: Provide continuity of thermal barrier at building enclosure in conjunction with thermal insulating materials in Section 07212. Overlap insulations to ensure complete thermal envelope at all exterior surfaces.

1.04 COORDINATION
- A. Coordinate the work with all related Sections for installation of vapor retarder and other forms of insulation.

PART 2 PRODUCTS

2.01 MANUFACTURERS - INSULATION MATERIALS
- A. OWENS-CORNING FIBERGLASS Product - thermal batt insulation.
  1. Sound Attenuation batt insulation.
  2. Flame Spread 25, smoke developed 50, Fiberglass insulation and Facing
  3. Perm rating of .02.
- B. Substitutions: Under provisions of the General Requirements.

2.02 MATERIALS
- A. Batt Insulation: ASTM C665; preformed glass fiber batts; loose laid and taped, conforming to the following:
  1. Thermal Resistance: R-13 minimum at walls.
  2. Batt Size and Facing: 3 1/2" FSK (foil) at exterior walls.
- B. Sound Batt Insulation:
  1. Batt size: 3 1/2" and 6" – coordinate with wall thickness.
  2. Facing: Unfaced.
- C. Tape: Self-adhering type as recommended by the manufacturer, mesh reinforced, 2 inches wide.

PART 3 EXECUTION

3.01 EXAMINATION
- A. Verify site conditions.
- B. Verify that substrate, adjacent materials, and insulation are dry and ready to be installed.

3.02 INSTALLATION
- A. Install insulation and vapor retarder in accordance with manufacturer's instructions.
- B. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- C. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation.
- D. Install with applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane, caulk or tape.
- E. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

END OF SECTION 07213

SECTION 07620

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Cap and sill flashings.
- B. Counterflashings at roof mounted equipment and vent stacks.
- C. Entry awnings.
- D. Collector box.
- E. West entry fascia (back side)
- F. Miscellaneous flashings and closure pieces.

1.02 SUBMITTALS
- A. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.03 QUALITY ASSURANCE
- A. Perform work in accordance with SMACNA standard details and requirements.

1.04 QUALIFICATIONS
- A. Fabricator and Installer: Company specializing in sheet metal flashing work with three years documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING
- A. Deliver, store, protect and handle products to site under provisions of the General Requirements.
- B. Stack preformed and pre-finished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- C. Prevent contact with materials which may cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS
- A. Pre-Coated Galvanized Steel: ASTM A446, Grade A, G90 zinc coating; 22 gage core steel, unless noted otherwise, exposed flashings shall be shop prefinished with KYNAR coating of color as selected.
- B. **Back Side of West Entry Fascia**: Shall be similar to MBCI, FW-120, 12” wide x 1” tall, smooth finish, 24 gage, full range of standard colors.
- C. **New Entry Awnings Roof**: Pre-Coated Galvanized Steel, ASTM A446, Grade A, G90 zinc coating prefinished with KYNAR coating of color as selected; 22 gage core steel, similar to MBCI PBR Series 36” wide x 1 ¼” tall, smooth finish.

2.02 ACCESSORIES
- A. Fasteners: Galvanized steel with soft neoprene washers.
- B. Underlayment: ASTM D2178, No. 15 asphalt saturated roofing felt.
- C. Slip Sheet: Rosin sized building paper.
- D. Primer: Zinc chromate type.
- E. Sealant: Polyurethane type, specified in Section 07900.
- F. Bedding Compound: Rubber-asphalt type.
- G. Plastic Cement: ASTM D4586, Type II.
- H. Reglets: Recessed type, galvanized steel; face and ends covered with plastic tape.

2.04 FABRICATION
- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Fabricate cleats of metal, same material as sheet, interlockable with sheet.
- C. Form pieces in longest possible lengths. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- D. Form material with flat lock seams.

E. Fabricate corners from one piece with minimum 18 inch long legs; seam and/or solder for rigidity, seal with sealant.
F. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.
G. Fabricate flashings to allow toe to extend 2 inches over roofing. Return and brake edges.

2.05 FINISH
A. Exposed metal shall pre-finished with Kynar finish color to be selected.

PART 3 EXECUTION

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

3.02 PREPARATION
A. Install starter and edge strips, and cleats before starting installation.
B. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.
D. Paint all contact between aluminum and steel with one coat asphaltium paint typical.

3.03 INSTALLATION
A. Conform to drawing details included in the SMACNA manual unless otherwise indicated on the drawings.
B. Insert flashings into reglets to form tight fit. Secure in place with lead wedges. Pack remaining spaces with lead wool. Seal flashings into reglets with sealant.
C. Apply plastic cement compound between metal flashings and felt flashings.
D. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
E. Seal metal joints watertight.

END OF SECTION 07620

SECTION 07841

THROUGH-PENETRATION FIRESTOP SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes through-penetration fire stop systems for penetrations through fire-resistance-rated constructions and floor ceiling assemblies, including both empty openings and openings containing penetrating items. Reference drawings (Code Footprint) for areas of rated walls.

1.2 PERFORMANCE REQUIREMENTS

A. General: For penetrations through the following fire-resistance-rated constructions, and floor ceiling assemblies, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

1. Fire-resistance-rated walls including fire walls, fire partitions, fire barriers and smoke barriers.
2. Fire-resistance-rated horizontal assemblies including floors, floor/ceiling assemblies and ceiling membranes of roof/ceiling assemblies.

B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined:

1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
   a. Penetrations located outside wall cavities.
   b. Penetrations located outside fire-resistance-rated shaft enclosures.

C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
2. For floor penetrations with annular spaces exceeding 4 inches (100 mm) in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing through-penetration firestop systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance

B. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.6 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

C. Notify Owner's inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 FIRESTOPPING, GENERAL

A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.

1. Permanent forming/damming/backing materials, including the following:
   a. Slag-/rock-wool-fiber insulation.
   b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
   c. Fire-rated form board.
   d. Fillers for sealants.
2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

2.2 FILL MATERIALS

A. General: Provide through-penetration firestop systems containing the types of fill materials indicated in the Through-Penetration Firestop System Schedule at the end of Part 3 by referencing the types of materials described in this Article. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.

B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

C. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.

D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.

F. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

H. 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.

I. 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.

J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

K. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
2. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
3. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.

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 of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified, independent inspecting agency to inspect through-penetration firestops. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.

B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.5 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

END OF SECTION 07841

SECTION 07900
JOINT SEALERS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Preparing substrate surfaces.
B. Sealant and joint backing.

1.02 QUALITY ASSURANCE
A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
B. Perform acoustical sealant application work in accordance with ASTM C919.

1.03 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
B. Applicator: Company specializing in performing the work of this section with minimum years documented experience.

1.05 WARRANTY
A. Provide five year warranty.
B. Warranty: Include coverage for installed sealants and accessories which fail to achieve air tight seal, water tight seal, and exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 SEALANTS
A. Exterior vertical joints shall be filled with a one-part nonacid-curing silicone sealant. Sealant shall be Type S, Grade NS, Class 25, and providing 35% movement in both extension and compression for a total of 70% movement.
1. Acceptable products are as follows:
a. "Chem-Calk Ncure 2000"; Bostik Construction Products Div.
b. "Dow Corning 790"; Dow Corning Corp.
c. "Silglaze N SCS 2501"; General Electric Co.
d. "Silpruf SCS 2000"; General Electric Co.
e. "864"; Pecora Corp.
f. "Rhodorsil 5C"; Rhone-Poulenc Inc.
g. "Spectrum 1"; Tremco, Inc.

B. Interior joints in toilet rooms, showers, janitor closets, and other similar locations shall be sealed with a one-part, mildew-resistant, silicone sealant. Sealant shall be type S, Grade NS, class 25 formulated with fungicide and intended for sealing interior joints with nonporous substrates and subject to in-service exposure to conditions of high humidity and temperature extremes.
1. Acceptable products are as follows:
a. "Dow Corning 786"; Dow Corning Corp.
b. "SCS 1702 Sanitary"; General Electric Co.
c. "863 #345 White"; Pecora Corp.
d. "Rhodorsil 6B White"; Rhone-Poulenc Inc.
e. "Proglaze White"; Tremco Corp.
f. "OmniPlus"; Sonneborn Building Products Div.

C. Interior joints in locations other than those otherwise specified, including at where new and existing windows meet other materials, shall be sealed with manufacturer's standard, one part, nonsag, mildew-resistant, acrylic-emulsion sealant complying with ASTM C 834, formulated to be paintable and recommended for exposed applications on interior and on protect exterior locations involving joint movement of not more than plus or minus 5%.
1. Acceptable products are as follows:
a. "Chem-Calk 600"; Bostik Construction Products Div.

b. "AC-20"; Pecora Corp.
c. "Sonolac"; Sonneborn Building Products Div.; Rexnord Chem.

D. At all sealant locations in fire rated assemblies provide manufacturer's standard fire-stopping sealant, with accessory materials, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.
1. Acceptable products are as follows:
a. "Dow Corning Fire Stop Foam"; Dow Corning Corp.
b. "Pensil 851"; General Electric Co.
c. "Fire Barrier CP-25 & 303"; 3M.

2.02 ACCESSORIES
A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
C. Joint Backing: ASTM D1056; round, closed or open cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width.
D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

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

3.02 PREPARATION
A. Remove loose materials and foreign matter which might impair adhesion of sealant.
B. Clean and prime joints in accordance with manufacturer’s instructions.
C. Perform preparation in accordance with manufacturer’s instructions.
D. Protect elements surrounding the work of this section from damage or disfiguration.

3.03 INSTALLATION
A. Install sealant in accordance with manufacturer’s instructions.
B. Measure joint dimensions and size materials to achieve required 2:1 width/depth ratios.
C. Install joint backing to achieve a neck dimension no greater than 1/3 of the joint width.
D. Install bond breaker where joint backing is not used.
E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

3.04 SCHEDULE
A. Interior: Caulk around all frames, windows, doors, openings, trim, etc., as required to seal or fill gaps, cracks, to make material transitions watertight and/or visually tight and finished.
B. Exterior: Caulk around all frames, windows, doors, openings, trim, material transitions etc., as required to seal or fill gaps, cracks, to make material transitions watertight and/or visually tight finished.

END OF SECTION 07900

SECTION 08111

STANDARD STEEL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Non-rated, fire rated and thermally insulated steel doors and frames.
- B. Interior and exterior glazed light frames.

1.02 REFERENCES
- A. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.
- B. ANSI/SDI-100 - Standard Steel Doors and Frames.
- C. Door Hardware Institute (DHI) - The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware.
- D. NFPA 80 - Fire Doors and Windows.
- E. NFPA 252 - Fire Tests for Door Assemblies.
- F. UL 10B - Fire Tests of Door Assemblies.
- G. ANSI A151.1 – 1,000,000 cycle slam test for extra heavy duty doors and frames.

1.03 SUBMITTALS
- A. Submit under provisions of the General Requirements.
- B. Shop Drawings: Indicate door and frame elevations, internal reinforcement, closure method, and cut-outs for glazing and finish.
- C. Product Data: Indicate door and frame configurations, anchor types and spacings, location of cut-outs for hardware reinforcement.
- D. Manufacturer's Installation Instructions: Indicate special installation instructions.

1.04 REGULATORY REQUIREMENTS
- A. Fire Rated Door and Frame Construction: Conform to ASTM E152 and NFPA 252.
- B. Installed Door and Panel Assembly: Conform to NFPA 80 for fire rated class as scheduled.

1.05 DELIVERY, STORAGE, AND HANDLING
- A. Deliver, store, protect, and handle products to site.
- B. Accept doors and frames on site in manufacturer's packaging. Inspect for damage.

1.06 FIELD MEASUREMENTS
- A. Verify that field measurements are as indicated on shop drawings.

PART 2 PRODUCTS

2.01 DOOR MANUFACTURERS
- A. Atlantic Metal Products, Inc.
- B. Overly Manufacturing Co.
- C. Williamsburg Steel Products.
- D. Curries Co.
- E. Substitutions: Under provisions of the General Requirements.

2.02 DOORS
- A. Exterior Insulated Doors Non-thermally Broken: SDI-100 Grade III.
- B. Interior Doors (Non-rated and Fire Rated): SDI-100 Grade III.

2.03 DOOR CONSTRUCTION
- A. Face: Steel sheet in accordance with ANSI/SDI-100. Galvanized at exterior locations.
- B. Core: Polystyrene foam.
- C. Thermal Insulated Door: Total insulation R value of 7.7, measured in accordance with ASTM C236.

2.04 FRAMES
- A. Exterior Frames: 16 gage thick material, base metal thickness.
- B. Interior Frames: 16 gage thick material, base metal thickness.

2.05 ACCESSORIES
- A. Removable Stops: Rolled steel channel shape, mitered corners; prepared for countersink style screws.
- B. Primer: Zinc chromate type.
- C. Silencers: Resilient rubber, fitted into drilled hole.
- D. Glazing: 1" insulated at exterior doors.

2.06 FABRICATION
- A. Astragals for Double Doors: Steel, T shaped, specifically for double doors.
- B. Fabricate doors with hardware reinforcement welded in place.
- C. Attach fire rated label to each door unit.
- D. Close top and bottom edge of exterior doors with flush end closure. Seal joints watertight.
- E. Configure exterior doors with special profile to receive recessed weatherstripping.
- F. Fabricate frames as welded unit.
- G. Mullions for Double Doors: Removable type, of same profiles as jambs.
- H. Transom Bars for Glazed Lights: Fixed type, of same profiles as jamb and head.
- I. Fabricate frames with hardware reinforcement plates welded in place. Provide mortar guard boxes.
- J. Reinforce frames wider than 48 inches with roll formed steel channels fitted tightly into frame head, flush with top.
- K. Prepare frame for silencers. Provide three single silencers for single doors and mullions of double doors on strike side. Provide two single silencers on frame head at double doors without mullions.
- L. Configure exterior frames with special profile to receive recessed weatherstripping.
- M. Fabricate frames to suit masonry wall coursing with 4 or 2 inch head member.

2.07 FINISH
- A. Steel Sheet: Galvanized to ASTM A525.
- B. Primer: Baked.
- C. Coat inside of frame profile with bituminous coating to a thickness of 1/16 inch.
- D. Doors and frames to be field painted.

PART 3 EXECUTION

3.01 EXAMINATION
- A. Verify that opening sizes and tolerances are acceptable.

3.02 INSTALLATION
- A. Install doors and frames in accordance with ANSI/SDI-100 and DHI.
- B. Coordinate installation of glass and glazing.
- C. Install door louvers, plumb and level.
- D. Coordinate installation of doors and frames with installation of frames and hardware specified in Section 08710.
- E. Coordinate with masonry and wallboard wall construction for anchor placement.
- F. Install roll formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.

3.03 ERECTION TOLERANCES
- A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.04 ADJUSTING
- A. Adjust door for smooth and balanced door movement.

END OF SECTION 08111

SECTION 08211
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Flush wood doors; flush and flush glazed configuration; fire rated and non-rated, **Field Finished**.

1.02 SUBMITTALS
A. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, identify cutouts for glazing, and louvers.
B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics; factory machining criteria, and factory finishing criteria.
C. Manufacturer's Installation Instructions: Indicate special installation instructions.

1.03 QUALITY ASSURANCE
A. Perform work in accordance with AWI Quality Standard Section 1300, Custom Grade.
B. Finish doors in accordance with AWI Quality Standard, grades identified in schedule.

1.04 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.05 REGULATORY REQUIREMENTS
A. Fire Door Construction: Conform to NFPA 252, UL 10B.
B. Installed Fire Rated Door Assembly: Conform to NFPA 80 for fire rated class as scheduled.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Deliver, store, protect, and handle products to site.
B. Accept doors on site in manufacturer's packaging. Inspect for damage. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges if stored more than one week. Break seal on-site to permit ventilation.

1.07 FIELD MEASUREMENTS
A. Verify that field measurements are as indicated on shop drawings.

1.08 COORDINATION
A. Coordinate the work with door opening construction, door frame and door hardware installation.

1.09 WARRANTY
A. Provide warranty to the following term:
1. Exterior Doors: 5 years.
2. Interior Doors: Life of original installation.
B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Graham
B. VT Industries
C. Marshfield Door Systems
D. Substitutions: Under provisions of the General Requirements.

2.02 DOOR TYPES
A. Flush Interior Doors: 1-3/4 inches thick; solid core construction, fire rated as indicated.

2.03 DOOR CONSTRUCTION
A. Core (Solid, Non-Rated): AWI Section 1300, Type PC-Particleboard.
B. Core (Solid, Fire Rated): AWI Section 1300, Type FP or FM rating as required or indicated.

2.04 FLUSH DOOR AND FRAME/JAMB FACING

A. Veneer Facing (Flush Interior Doors): AWI Custom quality **Rotary Select White Birch** uniform grain. Doors shall be field finished. Submit samples for Owner's approval.

2.05 ACCESSORIES

A. Glazing Stops: Wood, of same species as door facing Wood with metal clips for rated doors, mitered corners; prepared for countersink style screws.

2.06 FABRICATION

A. Fabricate non-rated doors in accordance with AWI Quality Standards requirements.
B. Fabricate fire rated doors in accordance with AWI Quality Standards and to UL requirements. Attach fire rating label to door.
C. Astragals for Fire Rated Double Doors: Steel, T shaped, overlapping and recessed at face edge, specifically for double doors.
D. Provide lock blocks at lock edge and top of door for closer hardware reinforcement.
E. Vertical Exposed Edge of Stiles: Of same species as veneer facing. Hardwood for transparent finish.
F. Fit door edge trim to edge of stiles after applying veneer facing.
G. Bond edge banding to cores.
H. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware. Provide solid blocking for through bolted hardware.
I. Factory pre-fit doors for frame opening dimensions identified on shop drawings.
J. Cut and configure exterior door edge to receive recessed weather stripping devices. Provide edge clearances in accordance with AWI 1600.

2.07 FINISH

A. Manufacturer's prefinished doors in accordance with AWI Quality Standard Section 1500 to the following finish designations: Pre-finished Doors: Submit full line of actual samples for selection.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes and tolerances are acceptable.
B. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install fire rated and non-rated doors in accordance with AWI Quality Standard, NFPA 80 and to Warnock Hersey requirements.
B. Trim non-rated door width by cutting equally on both jamb edges.
C. Trim door height by cutting bottom edges to a maximum of 3/4 inch (19 mm). Trim fire door height at bottom edge only, in accordance with fire rating requirements.
D. Pilot drill screw and bolt holes. Use threaded through bolts for half surface hinges.
E. Machine cut for hardware. Core for handsets and cylinders.
F. Coordinate installation of glass and glazing.

3.03 INSTALLATION TOLERANCES

A. Maximum Diagonal Distortion (Warp): 1/8 inch measured with straight edge or taught string, corner to corner, over an imaginary 36 x 84 inch surface area.
B. Maximum Vertical Distortion (Bow): 1/8 inch measured with straight edge or taught string, top to bottom, over an imaginary 36 x 84 inch surface area.
C. Maximum Width Distortion (Cup): 1/8 inch measured with straight edge or taught string, edge to edge, over an imaginary 36 x 84 inch surface area.

3.04 ADJUSTING

A. Adjust door for smooth and balanced door movement.

END OF SECTION 08211

SECTION 08410

ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Aluminum doors and frames.
- B. Vision glass and glass.
- C. Door hardware.
- D. Integral air and vapor barrier.
- E. Perimeter sealant.

1.02 SYSTEM DESCRIPTION
- A. Aluminum entrances and storefront system includes tubular aluminum sections with supplementary internal support framing, shop fabricated, factory prefinished, vision glass, related flashings, anchorage and attachment devices.

1.03 PERFORMANCE REQUIREMENTS
- A. Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall as calculated in accordance with codes.
- B. Limit mullion deflection to flexure limit of glass; with full recovery of glazing materials.
- C. System to accommodate, without damage to components or deterioration of seals, movement within system, movement between system and peripheral construction, dynamic loading and release of loads, deflection of structural support framing.
- D. Limit air leakage through assembly to 0.06 cfm/min/sq. ft. of wall area, measured at a reference differential pressure across assembly of psf as measured in accordance with AAMA 501.
- E. Water Leakage: None, when measured in accordance with AAMA 501 with a test pressure difference of 2.86 lbs/sq. ft.
- F. Maintain continuous air and vapor barrier throughout assembly, primarily in line with inside pane of glass and heel bead of glazing compound.
- G. System to provide for expansion and contraction within system components caused by a cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental affect to system components.
- H. Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to the exterior by a weep drainage network.

1.04 SUBMITTALS
- A. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work and expansion and contraction joint location and details.

1.05 DELIVERY, STORAGE, AND HANDLING
- A. Deliver, store, protect and handle products to site.
- B. Protect pre-finished aluminum surfaces. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

1.06 ENVIRONMENTAL REQUIREMENTS
- A. Do not install sealants when ambient temperature is less than 40 degrees F during and 48 hours after installation.

1.07 FIELD MEASUREMENTS
- A. Verify that field measurements are as indicated on shop drawings.

1.08 WARRANTY
- A. Provide three year warranty.
- B. Warranty: Include coverage for complete system for failure to meet specified requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS
- A. Storefront System
  1. Manko - Product series – 2450 FS, Door series - 150 H Wide Style.

2. Other acceptable manufacturers offering equivalent Products.
   a. Kawneer.
   b. Amarlite.
   c. EFCO.
3. Substitutions: Under provisions of the General Requirements.

2.02 MATERIALS
A. Extruded Aluminum: ANSI/ASTM B221; 6063 alloy, T5 temper. Color: **Clear Aluminum.**
B. Steel Sections: ANSI/ASTM A36; shaped to suit mullion sections.
C. Fasteners: Galvanized steel.

2.03 COMPONENTS
A. Frame: 4 1/2 x 2 inch nominal dimension; glazing stops; drainage holes; internal weep drainage system.
B. Doors: 2 inches thick, 5-inch wide top rail, 5-inch wide vertical stiles, 6-inch wide bottom rail; square glazing stops.
C. Flashings: Aluminum, finish to match mullion sections where exposed.

2.04 GLASS AND GLAZING MATERIALS
A. Glass and Glazing Materials: As specified in Section 08800 of types described below:
   1. Glass at Exterior Lights: 1-inch insulated type (outer pane of ¼ inch tinted **SolarBronze** at exterior, inner pane of ¼ inch clear). Tempered where required. **Low-E coating on third surface.**
   2. Where units are scheduled to receive laminated glass, outer pane to be tinted TG, inner pane to be clear SRG. Reference section 08800

2.05 SEALANT MATERIALS
A. Sealant and Backing Materials: As specified in Section 07900.

2.06 HARDWARE
A. Weather Stripping, Sill Sweep Strips, Thresholds, Hinges, Tubular Pull Handles, Panic Device, Closer: Manufacturers' standard type to suit application, and finish, all provided by storefront manufacturer / supplier.
B. Cylinder locks by hardware supplier.

2.07 FABRICATION
A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
C. Prepare components to receive anchor devices. Fabricate anchors.
D. Arrange fasteners and attachments to conceal from view.
E. Prepare components with internal reinforcement for door hardware and door operator hinge hardware.
F. Reinforce framing members for imposed loads.

2.08 FINISHES
A. Finish coatings to conform to AAMA
B. **Exposed Aluminum Surfaces: Clear Aluminum**.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify site opening conditions.
B. Verify dimensions, tolerances, and method of attachment with other work.
C. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.

3.02 INSTALLATION
A. Install wall system in accordance with manufacturer's instructions and AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.
B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
E. Provide thermal isolation where components penetrate or disrupt building insulation.
F. Install sill flashings.
G. Coordinate attachment and seal of perimeter air and vapor barrier materials.
H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
I. Set thresholds in bed of mastic and secure.
J. Install hardware using templates provided.
K. Install glass in accordance with Section 08800, to glazing method required to achieve performance criteria.
L. Install perimeter sealant to method required to achieve performance criteria, backing materials, and installation criteria in accordance with Section 07900.

3.03 TOLERANCES
A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 1/16 inches per 10 feet, whichever is less.
B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 ADJUSTING
A. Adjust operating hardware and sash for smooth operation.

3.05 CLEANING
A. Remove protective material from prefinished aluminum surfaces.
B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
C. Remove excess sealant by method acceptable to sealant manufacturer.

3.06 PROTECTION OF FINISHED WORK
A. Protect finished Work from damage.

END OF SECTION 08410

SECTION 08520
ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Extruded aluminum insulated windows with one horizontal sliding sash and one fixed sash; glass, shop glazed; panning and receptor systems.
- B. Hardware, and insect screens.
- C. Perimeter sealant.
- D. **1" Integral Mini-blinds.**

1.02 SYSTEM DESCRIPTION
- A. Windows: Tubular aluminum sections, shop fabricated, factory prefinished, vision glass, related flashings, anchorage and attachment devices.
- B. Configuration: Casement and fixed; all with manufacturer's standard panning and receptor systems.

1.03 PERFORMANCE REQUIREMENTS
- A. Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall as measured in accordance with ASTM E330.
- B. Limit member deflection to 1/200; with full recovery of glazing materials.
- C. System to accommodate, without damage to components or deterioration of seals, movement between window and perimeter framing, deflection of lintel.
- D. Limit air leakage through assembly to 0.10 cfm/min/sq. ft. of wall area, measured at a reference differential pressure across assembly of 6 psf as measured in accordance with ASTM E283.
- E. Water Leakage: None, when measured in accordance with ASTM E331 with a test pressure difference of 9 lb./sq. ft.
- F. Maintain continuous air and vapor barrier throughout assembly, primarily in line with inside pane of glass and heel bead of glazing compound.
- G. Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to the exterior by a weep drainage network.

1.04 SUBMITTALS
- A. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work; installation requirements.
- B. Product Data: Provide component dimensions, anchorage and fasteners, glass, internal drainage details.

1.05 DELIVERY, STORAGE, AND HANDLING
- A. Protect prefinished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

1.06 ENVIRONMENTAL REQUIREMENTS
- A. Do not install sealants when ambient temperature is less than 40 degrees F.
- B. Maintain this minimum temperature during and after installation of sealants.

1.07 FIELD MEASUREMENTS
- A. Verify that field measurements are as indicated on shop drawings.

PART 2 PRODUCTS

2.01 MANUFACTURERS
- A. MANCO Product
  1. 2135 Series windows with integral 1" mini-blinds. **Windows shall have sub-sill, head and jamb receptors.** Half side to be horizontal slider and the other half fixed.
- B. Substitutions: Submit for approval under provisions of the General Requirements.

2.02 MATERIALS
- A. Extruded Aluminum: ASTM B221; 6063 alloy, T5 temper. Color: White. .
- B. Fasteners: Galvanized steel.
- C. Insect Screens: FS RR-W-365, woven aluminum mesh.
- D. Operable Sash Weatherstripping: Neoprene; permanently resilient, profiled to effect weather seal.
- E. Fasteners: Galvanized steel.

2.03 GLASS AND GLAZING MATERIALS

A. Glass and Glazing Materials: Of Types described below:

1. Glass in Exterior Lights: 1 1/8 inch insulated - 1/8 inch exterior ES73 tempered; 1/8 inch interior clear tempered. **Low-E hard coat on third surface.**

2.04 INTEGRAL BLINDS

A. ScreenLine Integral Blind System SL20B with removable magnetic thumb turn at bottom corner of window unit.

2.05 HARDWARE

A. Provide stop for windows with tamper resistance screws/fasteners. Opening size shall be limited to 4".

2.06 SEALANT MATERIALS

A. Sealant and Backing Materials: As specified in Section 07900.

2.07 FABRICATION

A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
C. Prepare components to receive anchor devices. Fabricate anchors.
D. Arrange fasteners and attachments to ensure concealment from view.
E. Prepare components with internal reinforcement for operating hardware.
F. Provide internal reinforcement in mullions with galvanized steel members to maintain rigidity.
G. Permit internal drainage weep holes and channels to migrate moisture to exterior. Provide internal drainage of glazing spaces to exterior through weep holes.

2.08 FINISHES

A. Finish coatings to conform to AAMA 608.1.
B. Exterior Exposed Aluminum Surfaces: White.
C. Integral mini-blinds – full range of colors.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install window frames, glass and glazing and hardware in accordance with manufacturers instructions.
B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances, aligning with adjacent work.
D. Install sill and sill end angles (i.e. Standard panning system).
E. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
F. Coordinate attachment and seal of perimeter air and vapor barrier materials.
G. Install operating hardware.

3.02 TOLERANCES

A. Maximum Variation from Level or Plumb: 0.06 inch every 3 ft non-cumulative or 0.5 inch per 100 ft., whichever is less.

3.03 ADJUSTING

A. Adjust operating hardware for smooth operation.

3.04 CLEANING

A. Remove protective material from prefinished aluminum surfaces.
B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
D. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manuf.

END OF SECTION 08520

SECTION 08710

DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Hardware for wood and hollow steel doors.
- B. Thresholds.
- C. Weatherstripping, seals and door gaskets.

1.02 ALLOWANCES
- A. Cash Allowance: This contractor shall install and furnish all Finish Hardware not specified in other sections, such as millwork. This contractor shall allow the sum of **$40,000.00** for the purchase and delivery of hardware only.
- B. Allowance includes purchase and delivery of hardware only. Installation is included in the Contractor's Bid price, not the allowance. Any differential in the allowance listed and the original invoices from suppliers will be adjusted in the contract price.

1.03 REFERENCES
- A. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.

1.04 OPERATION AND MAINTENANCE DATA
- A. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

1.05 QUALIFICATIONS
- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum 3 years' documented experience.
- B. **Hardware Supplier: To be approved by owner/architect.**

1.06 DELIVERY, STORAGE, AND HANDLING
- A. Deliver, store, protect and handle products to site.
- B. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.
- C. Deliver keys to Owner by security shipment direct from hardware supplier.

1.07 WARRANTY
- A. Provide five year warranty.

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

PART 2 PRODUCTS

2.01 KEYING
- A. Door Locks: Master keyed. Include construction keying, and key as instructed by Owner.

PART 3 EXECUTION

3.01 EXAMINATION
- A. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.
- B. Verify that electric power is available to power operated devices and of the correct characteristics.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions.
B. Use templates provided by hardware item manufacturer.
C. Mounting heights for hardware from finished floor to center line of hardware item:
   1. Locksets: 40"
   2. Push/Pulls: 45"
   3. Dead Locks: 48"
   4. Exit Devices: 42"
D. Thresholds not to exceed ½" in height.

END OF SECTION 08710

SECTION 08800

GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Glass and glazing for Sections referencing this Section for products and installation.

1.02 PERFORMANCE REQUIREMENTS
A. Glass and glazing materials of this Section shall provide continuity of building enclosure vapor and air barrier:
1. To utilize the inner pane of multiple pane sealed units for the continuity of the air and vapor seal.
2. Maintain continuous air and vapor barrier throughout glazed assembly from glass pane to heel bead of glazing sealant.
B. Size glass to withstand dead loads and positive and negative live loads acting normal to plane of glass as calculated in accordance with UBC 91 code.
C. Limit glass deflection to 1/200 flexure limit of glass with full recovery of glazing materials, whichever is less.

1.03 ENVIRONMENTAL REQUIREMENTS
A. Do not install glazing when ambient temperature is less than 50 degrees F.
B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.04 FIELD MEASUREMENTS
A. Verify that field measurements are as indicated on shop drawings.

1.05 COORDINATION
A. Coordinate the Work with glazing frames, wall openings, and perimeter air and vapor seal to adjacent Work.

1.06 WARRANTY
A. Provide five year manufacturer's warranty.
B. Warranty: Include coverage for sealed glass units from seal failure, interpane dusting or misting, reflective coating on mirrors, delamination of laminated glass and replacement of same.

PART 2 PRODUCTS

2.01 FLAT GLASS MATERIALS
A. Float Glass (Type FG): Clear, 1/4 inch thick minimum.
B. Safety Glass (Type SG): Clear; fully tempered with horizontal tempering 1/4 inch thick minimum at all locations where glass is less than 18 inches above finished floor, adjacent to doors, and Per Codes.
C. Tinted Glass (Type TG): Float type, heat strengthened, light reducing, color (to be selected); 1/4 inch thick minimum.
D. Wire Glass (Type WG): Clear, polished both sides diagonal mesh of woven stainless steel wire of 1/2 inch grid size; 1/4 inch thick.
E. Mirror Glass (Type MG): Clear tempered safety type with copper and silver coating, organic overcoating, beveled edges, 1/4 inch thick minimum, sizes as indicated.
F. Shatter Resistant Glass: (Type SRG): Clear laminated, 3/4 inch composite - 3 - 1/4-inch thick laminated panels, sizes as indicated.
G. Glazing in Fire Rated Doors: Clear tempered safety type. All glazing and stops shall be tested and approved for use in rated door assemblies. Provide etched identification as required by 2012 IBC.

2.02 SEALED INSULATING GLASS MATERIALS
A. **Insulated Glass Units (Type IG) at Existing Window Units**: ASTM E774 and E773; double pane with edge seal; Low E; outer pane of 1/8 inch glass tinted at No. 3 side, inner pane of 1/8 inch glass; ½" air space, Argon filled. **Match existing tinting.**
B. **Insulated Glass Units (Type IG) at New Window Units**: ASTM E774 and E773; double pane with edge seal; Low E; outer pane of 1/4 inch glass tinted at No. 3 side, inner pane of 1/4 inch glass; ½" air

space, Argon filled. **PPG Solarban 60 with SolarBronze tinting. Units shall have integral blinds within/between panes.**

2.03 GLAZING COMPOUNDS

A. Exterior windows not shop installed shall be glazed with vinyl or neoprene gaskets, extruded elastic polybutene tape sealant, a combination of polysulphide base compound and elastic glazing compound, or a combination of extruded polysulphide tape, polysulphide base compound elastic glazing compound.

B. Doors and interior stopped -in glass shall be glazed using putty or elastic glazing compound and stop beads.

C. Exterior glazing of steel sash shall be DAP Metal Glaze. Interior glazing of steel sash shall be DAP Steel Sash Putty.

2.04 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene or Silicone, 80 - 90 Shore A durometer hardness, length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene or Silicone, 50 - 60 Shore A durometer hardness, minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face. **Color: Clear Aluminum.**

C. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10 - 15 Shore A durometer hardness; coiled on release paper.

D. Glazing Clips: Manufacturer's standard type.

E. Mirror Attachment Accessories: Mirror adhesive, chemically compatible with mirror coating and wall substrate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerance.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

3.02 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.

D. Install glazing in accordance with Flat Jobbers Association Glazing Manual.

3.03 INSTALLATION - MIRRORS

A. Set mirrors with adhesive, applied in accordance with adhesive manufacturer's instructions.

B. Place plumb and level.

3.04 CLEANING

A. Remove glazing materials from finish surfaces. Remove labels after work is complete. Clean glass and mirrors.

3.05 PROTECTION OF FINISHED WORK

A. After installation, mark pane with an "X" by using removable plastic tape or paste. Do not mark heat absorbing or reflective glass units.

END OF SECTION 08800

SECTION 09260

GYPSUM BOARD SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Metal stud wall framing.
- B. Acoustical insulation.
- C. High Abuse Gypsum board.
- D. Taped and sanded joint treatment, **Level 4 finish**.

1.02 REFERENCES
- A. ASTM C36 - Gypsum Wallboard.
- B. ASTM C475 - Joint Treatment Materials for Gypsum Wallboard Construction.
- C. ASTM C630 - Water Resistant Gypsum Backing Board.

PART 2 PRODUCTS

2.01 MANUFACTURERS - GYPSUM BOARD SYSTEM
- A. National Gypsum Company.
- B. Other acceptable manufacturers offering equivalent products.
- C. Substitutions: Under provisions of the General Requirements.

2.02 FRAMING MATERIALS
- A. Reference Section 054000 Cold-Formed Metal Framing.

2.03 GYPSUM BOARD MATERIALS
- A. High Abuse Fire Rated Gypsum Board: ASTM C1629, Type "X" fire resistive type., UL rated, 5/8 inch thick, maximum permissible lengths, ends square cut, tapered edges. Product equal to National Gypsum, Gold Bond, Fire-Shield Hi-Abuse XP.

2.04 ACCESSORIES
- A. Acoustical Insulation: glass fiber, friction fit type, unfaced, 3 1/2 or 6 inch thick.
- B. Corner Beads: Metal.
- C. Edge Trim: GA 201 and GA 216; Type L bead.
- D. Joint Materials: ASTM C475; reinforcing tape, joint compound, adhesive, and water.
- E. Fasteners: ASTM C1002, Type S12, W, and GA-216.
- F. Resilient channel: USG, RC-1 or equal.
- G. Molded Reveal Joints: Fry Reglet, ¼" x ¼"; DRM – 25 – 25.

PART 3 EXECUTION

3.01 EXAMINATION
- A. Verify that site conditions are ready to receive work and opening dimensions are as indicated on shop drawings.

3.02 METAL STUD INSTALLATION
- A. Install studs in accordance with ASTM C754 and manufacturer's instructions.
- B. Metal Stud Spacing: 16 inches on center, unless noted otherwise.
- C. Refer to Drawings for indication of partitions, extend stud framing through the ceiling to the structure above, unless noted otherwise. Maintain clearance under structural building members to avoid deflection transfer to studs. Provide extended leg ceiling runners.
- D. Door Opening Framing: Install double studs at door frame jambs. Install stud tracks on each side of opening, at frame head height, and between studs and adjacent studs.
- E. Blocking: Nail wood blocking to studs or Bolt or screw steel channels to studs. Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, and hardware.

3.03 WALL FURRING INSTALLATION
- A. Erect wall furring for direct attachment to concrete block walls.

B. Erect furring channels vertically; space maximum 16 inches on center, not more than 4 inches from floor and ceiling lines, abutting walls.
C. Install thermal insulation between furring channels directly attached to concrete masonry walls in accordance with manufacturer's instructions.
D. Erect free-standing metal stud framing tight to concrete masonry walls, attached by adjustable furring brackets in accordance with manufacturer's instructions.

3.04 FURRING FOR FIRE RATINGS
A. Install furring as required for fire resistance ratings indicated.
B. Columns in rated walls shall be wrapped independently from wall system.

3.05 CEILING FRAMING INSTALLATION
A. Coordinate location of hangers with other work.
B. Install ceiling framing independent of walls, columns, and above ceiling work.
C. Reinforce openings in ceiling suspension system which interrupt main carrying channels or furring channels, with lateral channel bracing. Extend bracing minimum 24 inches past each end of openings.
D. Laterally brace entire suspension system.

3.06 ACOUSTICAL ACCESSORIES INSTALLATION
A. Install resilient channels at maximum 12 inches on center. Locate joints over framing members.
B. Place acoustical insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions, and tight to items passing through partitions.

3.07 GYPSUM BOARD INSTALLATION
A. Install gypsum board in accordance with manufacturer's instructions.
B. Erect single layer standard gypsum board vertical, with ends and edges occurring over firm bearing.
C. Erect single layer fire rated gypsum board vertically, with edges and ends occurring over firm bearing.
D. Use screws when fastening gypsum board to metal furring or framing.
E. Place second layer perpendicular to first layer. Offset joints of second layer from joints of first layer.
F. Erect exterior gypsum soffit board perpendicular to supports, with staggered end joints over supports.
G. Treat cut edges and holes in moisture resistant gypsum board and exterior gypsum board with sealant.
H. Place control joints consistent with lines of building spaces and as directed. Install at approximately 30' intervals in walls. Coordinate locations with Architect.
I. Place corner beads at external corners as indicated. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials as indicated.
J. Caulk at sound walls.

3.08 JOINT TREATMENT
A. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready for finishes.
B. Feather coats onto adjoining surfaces so that camber is maximum 1/32.
C. Taping, filling, and sanding is not required at surfaces behind adhesive applied ceramic tile.
D. Tape joints and corners of cementitious backing board using cement based joint compound as recommended by the manufacturer.
E. **Level 4 finish.** Finish shall be high quality professional appearance.

3.09 TOLERANCES
A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION 09260

SECTION 09306

FLOOR AND WALL TILE

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Ceramic tile floor finish using the thinset application method.
- B. Ceramic tile wall finish using the thinset application method.

1.02 SUBMITTALS
- A. Submit under provisions of the General Requirements.
- B. Product Data: Provide instructions for using adhesives and grouts.
- C. Samples: Submit two samples illustrating pattern, color variations, and grout color.

1.03 QUALIFICATIONS
- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.
- B. Installer: Company specializing in performing the Work of this section with minimum five years documented experience, approved by manufacturer, and preapproved by architect (20 days) prior to bid.

1.04 DELIVERY, STORAGE, AND HANDLING
- A. Deliver, store, protect and handle products to site.
- B. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.05 ENVIRONMENTAL REQUIREMENTS
- A. Do not install adhesives in an unventilated environment.
- B. Maintain 50 degrees F during installation of mortar materials.

PART 2 PRODUCTS

2.01 TILE MANUFACTURERS
- A. As indicated.

2.02 FLOOR TILE MATERIALS
- A. Porcelain Floor Tile:
  1. Daltile, Veranda Solids, 13"x13". Owner to select from full line.

2.03 WALL TILE MATERIALS
- A. Wall Tile:
  1. West Entry Facade: Crossville, Empire, 24"x24", Polished finish. Owner to select from full line.
  2. Restroom Wainscot Field Color (Rooms #121, #129, #239): American Olean, Glazed Wall Tile, Bright & Matte Group 1, 6"x6". Owner to select from full line. Provide bullnose at exterior exposed edges.
  3. Restroom Wainscot Accent Color (Rooms #121, #129, #239): American Olean, Glazed Wall Tile, Bright & Matte Group 1, 6"x6". Owner to select from full line.

2.04 EXTRA MATERIALS
- A. Provide one full carton of each color, style, or pattern.

2.05 BASE MATERIALS
- A. Base: Match wall tile for moisture absorption, surface finish, and color:

2.06 ADHESIVE MATERIALS
- A. Adhesives: Thinset bond type as recommended and/or manufactured by the tile manufacturer.

2.07 MORTAR MATERIALS
- A. Mortar Materials: Portland cement, sand, latex additive, and water as recommended and/or manufactured by the tile manufacturer, color to be selected.

2.08 TRIM: Provide Schluter trim to comply with the following requirements:

A. External Corner: Schluter, Rondec. Clear Aluminum. Symmetrically rounded outer corners on walls. Depth to match tile thickness.
B. Internal Corners: Field-butted square corners.
C. Exposed Top Edge: Schluter, Jolly. Clear Aluminum. Depth to match tile thickness.

2.09 GROUT

A. Selected from various manufacturer's full line.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work.

3.02 PREPARATION

A. Protect surrounding work from damage or disfiguration.
B. Vacuum clean surfaces and damp clean.
C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
D. Apply sealer conditioner to substrate surfaces in accordance with adhesive manufacturer's instructions.

3.03 INSTALLATION - THINSET METHOD

A. Install adhesive tile, thresholds, and grout in accordance with manufacturer's instructions and/or the TCA Handbook.
B. Tile pattern to be determined. Do not interrupt tile pattern through openings.
C. Place Schlutter edge strips at exposed tile edges.
D. Cut and fit tile tight to penetrations through tile. Form corners and bases neatly. Align floor, base and wall joints.
E. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.
F. Sound tile after setting. Replace hollow sounding units.
G. Keep expansion, control joints free of adhesive or grout. Apply sealant to joints.
H. Allow tile to set for a minimum of 48 hours prior to grouting.
I. Grout tile joints.
J. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.04 CLEANING

A. Clean tile and grout surfaces.

3.05 PROTECTION OF FINISHED WORK

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION 09306

SECTION 09511

SUSPENDED ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Suspended metal grid ceiling system and perimeter trim.
- B. Acoustical tile.

1.02 SYSTEM DESCRIPTION
- A. Installed System: Conform to Fed. Spec. SS-S-118B flame spread 25 or under UL Labeled for ceiling assembly.
- B. Suspension system to rigidly secure acoustical ceiling system including integral mechanical and electrical components with maximum deflection of 1/360.

1.03 SUBMITTALS
- A. Product Data: Provide data on metal grid system components, and acoustical units.
- B. Samples: Submit two samples illustrating material and finish of acoustical units.
- C. Samples: Submit two samples each, of suspension system main runner, cross runner, and edge trim.
- D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

1.04 QUALIFICATIONS
- A. Grid and Tile Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Conform to applicable code for combustibility requirements for materials.

1.05 ENVIRONMENTAL REQUIREMENTS
- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.06 EXTRA MATERIALS
- A. Provide 40 sq. ft. of extra tile to Owner. (Each type.)

PART 2 PRODUCTS

2.01 MANUFACTURERS - SUSPENSION SYSTEM
- A. Armstrong Contract Interiors: Type 1 - Prelude XL 15/16” heavy duty exposed tee grid, 2 x 2, white. Occurs at all locations unless noted otherwise.
- B. Armstrong Contract Interiors: Type 2 - Prelude Plus XL Aluminum, 15/16” exposed tee grid, 2 x2, white. Occurs at Rooms #207, #233, #234, #236, #239.

2.02 SUSPENSION SYSTEM MATERIALS
- A. Accessories: Stabilizer bars, clips, splices, edge moldings and light protection hoods required for rated suspended grid systems.
- E. Support Channels and Hangers: Size and type to suit application and ceiling system flatness requirement specified.

2.03 MANUFACTURERS - ACOUSTICAL UNITS
- A. Armstrong Contract Interiors
  1. Type 1 (All locations unless noted otherwise): School Zone Fine Fissured #1820, angled tegular edge, 2’x2’x3/4”, white.
  2. Type 2 (Occurs at Rooms #207, #233, #234, #236, #239): Ceramaguard, Fine Fissured, Perforated #607, square edge, 2’x2’x5/8”.
- B. Substitutions: Under provisions of the General Requirements.

2.04 ACCESSORIES
- A. Touch-up Paint: Type and color to match acoustical and grid units.
- B. Manufacturers accessories for complete and finished assembly.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - LAY-IN GRID SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636 and manufacturer's instructions and as supplemented in this section.
B. Install system capable of supporting imposed loads to a deflection of 1/360 maximum.
C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.
D. Locate system on room axis according to reflected plan.
E. Install after major above ceiling work is complete. Coordinate the location of hangers with other work.
F. Supply hangers or inserts for installation to Section with instructions for their correct placement.
G. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
H. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
I. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently.
J. Do not eccentrically load system, or produce rotation of runners.
K. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge moldings at junctions with other interruptions.
L. Form expansion joints as required or detailed. Form to accommodate plus or minus 1 inch movement. Maintain visual closure.
M. Install light fixture boxes constructed of gypsum board above light fixtures in accordance with UL assembly requirements.
N. Install additional hangers at fire rated ceiling assemblies, per manufacturer’s instruction or UL tested assembly.
O. Coordinate installation of suspension system with (but not limited too): Mechanical units, grilles and louvers.

3.03 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.
B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
C. Lay directional patterned units one way with pattern parallel to shortest room axis. Fit border trim neatly against abutting surfaces.
D. Install units after above ceiling work is complete.
E. Install acoustical units level, in uniform plane, and free from twist, warp and dents.
F. Cut tile to fit irregular grid and perimeter edge trim. Field rabbet tile edge. Double cut and field paint exposed edges of tegular units.
G. Lay acoustical insulation for a distance of 48 inches either side of acoustical partitions.
H. Install hold-down clips to retain panels tight to grid system as required for to meet ratings.
I. Coordinate installation of acoustical units with (but not limited too): Mechanical units, grilles and louvers.

3.04 ERECTION TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

END OF SECTION 09511

SECTION 09650

RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Luxury vinyl tile flooring.
- B. Sheet vinyl flooring
- C. Resilient base.
- D. Resilient stair treads and landings.

1.02 SUBMITTALS
- A. Product Data: Provide data on specified products, describing physical characteristics; sizes, patterns and colors available.
- B. Samples: Submit one sample, illustrating color and pattern for each floor material.
- C. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and seaming recommendations.

1.03 QUALIFICATIONS
- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.
- B. Installer: Company specializing in performing the Work of this section with minimum five years documented experience, approved by manufacturer, and preapproved by architect 20 days prior to bid.

1.04 REGULATORY REQUIREMENTS
- A. Conform to code for flame/smoke rating requirements in accordance with ASTM E84.

1.05 DELIVERY, STORAGE, AND HANDLING
- A. Deliver, store, protect and handle products to site under provisions of the General Requirements.
- B. Protect roll materials from damage.

1.06 ENVIRONMENTAL REQUIREMENTS
- A. Store materials for three days prior to installation in area of installation to achieve temperature stability.
- B. Maintain ambient temperature required by adhesive manufacturer three days prior to, during, and 24 hours after installation of materials.

1.07 MAINTENANCE DATA
- A. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.08 EXTRA MATERIALS
- A. Provide 60 sq. ft of each flooring; 10 lineal feet of each base material specified.

PART 2 PRODUCTS

2.01 MATERIALS – TILE FLOORING
- A. Luxury Vinyl Tile Plank: Shaw, Solitude, 6"x48". Owner to select from full line.
- B. J&J Commercial is an approved manufacturer.

2.02 MATERIALS – SHEET FLOORING
- A. Shannon Specialty Floors, Tuf Stuf – Plank You Very Much, 6' width. Owner to select from full line.

2.03 MATERIALS - BASE
- A. Johnsonite, Rubber, 6 inch tall x 1/8 inch thick, coved, premolded external corners, roll goods (**4 inch strips not allowed).**

2.04 MATERIALS – STAIR TREAD AND LANDING COVERING

A. Stair Treads and Landings: FS RR-T-650, Type B, Class 2; full width and depth of stair tread in one piece; return down edge of tread 3/4 inch with tapered thickness.
   1. Material: Rubber
   2. Thickness: 3/16 inch
   3. Pattern: Raised Circular.
   4. Color: Multiple colors to be selected by Architect.
   5. Design: Vantage Profile
   6. Manufacturers:
      a) Roppe
      b) Or as approved equal.

2.05 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
B. Primers and Adhesives: Waterproof; type as recommended by flooring manufacturer.
C. Edge Strips: Flooring material as approved.
D. **XL Brand Tri-Seal at all floor areas.**

PART 3 EXECUTION

3.01 PREPARATION

A. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
B. Prohibit traffic until filler is cured.
C. Vacuum clean substrate.
D. Apply primer as recommended by manufacturer.
E. **Install XL Brand Tri-Seal at all floor areas.**

3.02 INSTALLATION – LUXURY VINYL TILE FLOORING

A. Install in accordance with manufacturer's instructions.
B. Mix tile from container to ensure shade variations are consistent when tile is placed.
C. Spread only enough adhesive to permit installation of materials before initial set.
D. Set flooring in place, press with heavy roller to attain full adhesion.
E. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern.
F. Allow minimum 1/2 full size tile width at room or area perimeter.
G. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar.
H. Install resilient edge strips at unprotected or exposed edges, and where flooring terminates.
I. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.03 INSTALLATION - SHEET FLOORING

A. Install in accordance with manufacturer's instructions.
B. Spread only enough adhesive to permit installation of materials before initial set.
C. Set flooring in place, press with heavy roller to attain full adhesion.
D. Lay flooring with joints and seams in accordance with seaming plan.
E. Install sheet flooring to minimize seams. Provide minimum of 1/3 full roll width. Double cut sheet; provide continuously heat welded seal.
F. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar.
G. Install edge strips at unprotected or exposed edges, and where flooring terminates. Secure metal strips after installation of flooring with stainless steel screws. Secure resilient strips by adhesive.
H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
I. Install flooring in pan type floor access covers. Maintain floor pattern.
J. Install feature strips, edge strips, and floor markings where indicated. Fit joints tightly.

3.04 INSTALLATION - BASE

A. Fit joints tight and vertical. Maintain minimum measurement of 18 inches between joints.
B. Miter internal corners. At external corners, use premolded units or "V" cut back of base strip to 2/3 of its thickness and fold. At exposed ends, use premolded units.
C. Install base on solid backing. Bond tight to wall and floor surfaces.
D. Scribe and fit to door frames and other interruptions.

3.05 INSTALLATION – RUBBER STAIR TREAD AND LANDING FLOORING

A. Install in accordance with manufacturer's instructions.
B. Spread only enough adhesive to permit installation of materials before initial set.
C. Set flooring in place, press with heavy roller to attain full adhesion.
D. Lay flooring with joints and seams in accordance with seaming plan.
E. Install sheet flooring to minimize seams. Provide minimum of 1/3 full roll width. Double cut sheet; provide continuously heat welded seal.
F. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar.
G. Install edge strips at unprotected or exposed edges, and where flooring terminates. Secure metal strips after installation of flooring with stainless steel screws. Secure resilient strips by adhesive.
H. Turn up flooring to form base. Back floor and wall junction with cant strip. Provide cap strip to terminate base.
I. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
J. Install flooring in pan type floor access covers. Maintain floor pattern.
K. At movable partitions install flooring under partitions without interrupting floor pattern.
L. Install feature strips, edge strips, and floor markings where indicated. Fit joints tightly.

3.06 CLEANING

A. Clean all work as described in the General Requirements.
B. Remove access adhesive from floor, base, and wall surfaces without damage.
C. Clean surfaces in accordance with manufacturer's instructions.

3.07 PROTECTION OF FINISHED WORK

A. Protect finished Work.
B. Prohibit traffic on floor finish for 48 hours after installation.

END OF SECTION 09650

SECTION 09688

CARPET - GLUE DOWN

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Carpet placed with glue down method.
- B. Accessories.

1.02 ALLOWANCES
- A. Cash Allowance: This contractor shall install and furnish all carpet. This contractor shall allow the sum of $32.00 per square yard for purchase and delivery of carpet only.
- B. Allowance includes purchase and delivery of carpet only. Installation, glue and accessories are included in the Contractors Bid price, **not** the allowance. Any differential in the allowance amount listed above and original invoices from the mill/manufacturer will be adjusted in the contract price.

1.03 SUBMITTALS
- A. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- B. Samples: Submit two samples illustrating color and pattern for each carpet material specified.
- C. Submit two samples of edge strip, material for each color specified.
- D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

1.04 QUALIFICATIONS
- A. Manufacturer: Company specializing in manufacturing specified carpet with minimum five years documented experience.
- B. Installer: Company specializing in installing carpet with minimum five years documented experience, approved by manufacturer, and preapproved by architect 20 days prior to bid.

1.05 ENVIRONMENTAL REQUIREMENTS
- A. Store materials for 3 days prior to installation in area of installation to achieve temperature stability.
- B. Maintain minimum 70 degrees F ambient temperature 1 day prior to, during and 24 hours after installation.

1.06 MAINTENANCE DATA
- A. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.07 EXTRA MATERIAL
- A. Provide 120 sq. ft. of carpeting of each type, color, and pattern specified. Must be full/uncut tiles and/or full width pieces.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS – CARPETING
- A. J & J Industries.
- B. Patcraft
- C. Shaw.
- D. Substitutions: Under provisions of the General Requirements.
  1. **Carpet may be tile and/or roll goods.**
  2. **Four colors to be selected.**

2.02 ACCESSORIES
- A. Sub-Floor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Adhesive: Type compatible with carpet material and as recommended by carpet manufacturer.
- C. Edge Strips: Type, finish, color as selected.
- D. **XL Brand Tri-Seal at all floor areas.**

PART 3 EXECUTION

3.01 PREPARATION

A. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.
B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
C. Vacuum clean substrate.
E. **Install XL Brand Tri-Seal at all floor areas.**

3.02 INSTALLATION

A. Apply carpet and adhesive in accordance with manufacturer's instructions.
B. Verify carpet match before cutting to ensure minimal variation between dye lots.
C. Double cut carpet, to allow intended seam and pattern match. Make cuts straight, true, and unfrayed. Edge seam carpet at traffic areas.
D. Locate seams in area of least traffic.
E. Join seams by hot adhesive tape method. Form seams straight, not overlapped or peaked, and free of gaps.
F. Lay carpet tight and flat on subfloor, well fastened at edges, with a uniform appearance. Provide monolithic color, pattern, and texture match within any one area.
G. Do not change run of pile in any room where carpet is continuous through a wall opening into another room. Locate change of color or pattern between rooms under door centerline.
H. Cut and fit carpet around interruptions.
I. Bind cut edges where not concealed by edge strips.
J. Fit carpet tight to intersection with vertical surfaces without gaps.
K. Where wall bases are scheduled, cut carpet tight to walls. Fit carpet tight to vertical interruptions, leaving no gaps.

3.03 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
B. Clean and vacuum carpet surfaces.

END OF SECTION 09688

SECTION 09900

PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Surface preparation and field application of paints and coatings.

1.02 QUALIFICATIONS
- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Applicator: Company specializing in performing the work of this section with minimum years documented experience and approved by manufacturer.

1.03 DELIVERY, STORAGE, AND HANDLING
- A. Deliver, store, protect and handle products to site.
- B. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- C. Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- D. Store paint materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.04 ENVIRONMENTAL REQUIREMENTS
- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- C. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- D. Minimum Application Temperature for Varnish and Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 foot candles measured mid-height at substrate surface.

1.05 EXTRA MATERIALS
- A. Provide one full gallon of each color to owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS
- A. Manufacturer - Paint, Transparent Finishes, Stain, Primer Sealers, and Block Filler by SHERWIN-WILLIAMS or as approved equal.

2.02 MATERIALS
- A. Coatings: Ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating; good flow and brushing properties; capable of drying or curing free of streaks or sags.
- B. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.
- C. Patching Materials: Latex filler.
- D. Fastener Head Cover Materials: Latex filler.

2.03 FINISHES
- A. Refer to schedule at end of section for surface finish schedule.

PART 3 EXECUTION

3.01 EXAMINATION
- A. Verify that surfaces and substrate conditions are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
C. Test shop applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

A. Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
B. Correct defects and clean surfaces which affect work of this section. Remove existing coatings that exhibit loose surface defects.
C. Seal with shellac and seal marks which may bleed through surface finishes.
D. Impervious Surfaces: Remove mildew by scrubbing with solution of trisodium phosphate and bleach. Rinse with clean water and allow surface to dry.
E. Aluminum Surfaces Scheduled for Paint Finish: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.
F. Asphalt, Creosote, or Bituminous Surfaces Scheduled for Paint Finish: Remove foreign particles to permit adhesion of finishing materials. Apply compatible sealer or primer.
G. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.
H. Concrete Floors: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
I. Copper Surfaces Scheduled for a Paint Finish: Remove contamination by steam, high pressure water, or solvent washing. Apply vinyl etch primer immediately following cleaning.
J. Copper Surfaces Scheduled for a Natural Oxidized Finish: Remove contamination by applying oxidizing solution of copper acetate and ammonium chloride in acetic acid. Rub on repeatedly for required effect. Once attained, rinse surfaces with clear water and allow to dry.
K. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.
L. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
M. Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of trisodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
N. Plaster Surfaces: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
O. Uncoated Steel and Iron Surfaces: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand, power tool wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.
P. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
Q. Interior Wood Items Scheduled to Receive Paint Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.
R. Interior Wood Items Scheduled to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats.
S. Exterior Wood Scheduled to Receive Paint Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior caulking compound after prime coat has been applied.
T. Exterior Wood Scheduled to Receive Transparent Finish: Remove dust, grit, and foreign matter; seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes with tinted exterior caulking compound after sealer has been applied.
U. Glue-Laminated Beams: Prior to finishing, wash surfaces with solvent, remove grease and dirt.
V. Wood and Metal Doors Scheduled for Painting: Seal top and bottom edges with primer.

3.03 APPLICATION

A. **Apply products in accordance with manufacturer's instructions.**
B. Do not apply finishes to surfaces that are not dry.
C. Apply each coat to uniform finish.
D. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
E. Sand wood and metal lightly between coats to achieve required finish.
F. Vacuum clean surfaces free of loose particles. Use tack cloth just prior to applying next coat.
G. Allow applied coat to dry before next coat is applied.

H. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
I. Prime concealed surfaces of interior and exterior woodwork with primer paint.
J. Prime concealed surfaces of interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with mineral spirits.

3.04 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
B. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports except where items are prefinished.
C. Paint interior surfaces of air ducts, and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint, to visible surfaces. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
D. Paint exposed conduit and electrical equipment occurring in finished areas.
E. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.05 CLEANING

A. Collect waste material, which may constitute a fire hazard, place in closed metal containers and remove daily from site.

3.06 SCHEDULE

The following are for exterior and interior surfaces, and are products of Sherwin-Williams, unless noted otherwise.

EXTERIOR SURFACES

1. FERROUS METAL
   A. Painted (Gloss Finish/Alkyd Base)
      1st Coat: B50WZ0001 - Kem Kromik® Universal Metal Primer Off White
      2nd Coat: B66W00651 - Pro Industrial 0 VOC Acrylic Semi-Gloss Extra White
      3rd Coat: B66W00651 - Pro Industrial 0 VOC Acrylic Semi-Gloss Extra White

2. TRAFFIC AND PARKING LINE MARKING
   A. Painted
      1st Coat: Fast Dry Lead Free Waterborne Traffic Marking Paint-WHITE (BLUE AT ADA)
      2nd Coat: Fast Dry Lead Free Waterborne Traffic Marking Paint-WHITE (BLUE AT ADA)

INTERIOR SURFACES

1. WOOD AND PLYWOOD
   A. Painted (Eg-Shel Finish/Alkyd Base)
      1st Coat: B51W08020 - Multi-Purpose Latex Primer White
      2nd Coat: B31W00051 - ProClassic® WaterBorne Interior Acrylic Semi-Gloss Extra White
      3rd Coat: B31W00051 - ProClassic® WaterBorne Interior Acrylic Semi-Gloss Extra White
   B. Stained and Varnished (Clear Finish) Opened Grained Wood
      1st Coat: S64T00008 - Sher-Wood® Wiping Stain Clear
      2nd Coat: T77F00037 - Sher-Wood® Catalyzed Lacquer PreCat Medium Rubbed Effect
      3rd Coat: T77F00037 - Sher-Wood® Catalyzed Lacquer PreCat Medium Rubbed Effect

2. CONCRETE BLOCK (CMU)
   A. Painted (Semi-Gloss Finish/Epoxy Base)
      1st Coat: A24W00200 - Loxon® Block Surfacer White
      2nd Coat: B20W02651 - ProMar® 200 Zero VOC Interior Latex Eg-Shel Extra White
      3rd Coat: B20W02651 - ProMar® 200 Zero VOC Interior Latex Eg-Shel Extra White

3. GYPSUM WALLBOARD AND PLASTER
   A. Painted (Eg-Shel Finish/Latex Base)
      1st Coat: B28W02600 - ProMar 200, Zero VOC Interior Latex Primer White
      2nd Coat: B20W02651 - ProMar 200 Zero VOC Interior Latex Eg-Shel Extra White
      3rd Coat: B20W02651 - ProMar 200 Zero VOC Interior Latex Eg-Shel Extra White

4. FERROUS METAL
   A. Painted (Semi-gloss Finish/Alkyd Base)
      1st Coat: B50WZ0001 - Kem Kromik® Universal Metal Primer Off White
      2nd Coat: B55W00101 - Direct-To-Metal Enamel Pure White
      3rd Coat: B55W00101 - Direct-To-Metal Enamel Pure White
      NOTE: Doors and Frames to be sprayed. No brush/roller marks will be accepted.

5. GALVANIZED METAL/ALUMINUM
   A. Painted (Semi-Gloss Finish/Alkyd Base)
      1st Coat: B66W00310 - Pro Industrial Pro-Cryl® Universal Primer Off White
      2nd Coat: B66W00651 - Pro Industrial 0 VOC Acrylic Semi-Gloss Extra White
      3rd Coat: B66W00651 - Pro Industrial 0 VOC Acrylic Semi-Gloss Extra White

6. CONCRETE FLOORS (SEALED)
   A. Painted (Clear Acrylic Floor Finish)
      1st Coat: 10.000004 - H&C Silicone Acrylic Concrete Sealer Clear
      2nd Coat: 10.000004 - H&C Silicone Acrylic Concrete Sealer Clear

7. INTUMESCENT COATING AT ELEVATOR SHAFT (reference CFP drawing sheet)
   A. Painted for 1-hour fire barrier
      1st Coat: FlameOff Coatings Inc, FlameOff Fire Barrier Paint, 15 mil thickness minimum.
      2nd Coat: FlameOff Coatings Inc, FlameOff Fire Barrier Paint, 15 mil thickness minimum.

END OF SECTION 09900

SECTION 10522

FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Fire extinguishers. (8 total)
- B. Accessories.

1.02 SUBMITTALS
- A. Shop Drawings: Indicate cabinet physical dimensions, rough-in measurements for recessed cabinets, wall bracket mounted measurements, and location.
- B. Product Data: Provide extinguisher operational features, color and finish, and anchorage details.
- C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

1.03 OPERATION AND MAINTENANCE DATA
- A. Maintenance Data: Include test, refill or recharge schedules and recertification requirements.

1.04 ENVIRONMENTAL REQUIREMENTS
- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS
- A. LARSEN'S
- B. Substitutions: Under provisions of the General Requirements.

2.02 EXTINGUISHERS
- A. Dry Chemical Type: Larsen's MP series MP5, Cast steel tank, with pressure gage.
- B. Quantity: 8 Total.

2.03 ACCESSORIES
- A. Extinguisher Brackets: Formed steel, enamel finish.

PART 3 EXECUTION

3.01 EXAMINATION
- A. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION
- A. Install in accordance with manufacturer's instructions.
- B. Secure rigidly in place.
- C. Place extinguishers in cabinets.
- D. Verify exact location with Architect.

END OF SECTION 10522

SECTION 10800

TOILET AND BATH ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES
- A. Toilet and washroom accessories.
- B. Grab bars.
- C. Attachment hardware.

PART 2 PRODUCTS

2.01 MANUFACTURERS
- A. BOBRICK WASHROOM EQUIPMENT INC, or BRADLEY CORPORATION.
- B. Accessory manufacturers as scheduled. BOBRICK and BRADLEY are approved manufacturers provided product is equivalent to scheduled item.
- C. Substitutions: Under provisions of the General Requirements.

2.02 FABRICATION
- A. Weld and grind joints of fabricated components, smooth.
- B. Form exposed surfaces from single sheet of stock, free of joints. Form surfaces flat without distortion. Maintain surfaces without scratches or dents.
- C. Fabricate grab bars of tubing, free of visible joints, return to wall with end attachment flanges. Form bar with 1 1/2 inches clear of wall surface. Knurl grip surfaces.
- D. Shop assemble components and package complete with anchors and fittings.
- E. Provide steel anchor plates, adapters, and anchor components for installation.

2.03 FINISHES
- A. Galvanizing: ASTM A123 to 1.25 oz./sq. yd. Galvanize ferrous metal and fastening devices.
- B. Chrome/Nickel Plating: ASTM B456, satin finish.
- C. Stainless Steel: No. 4 satin luster finish.
- D. Back paint components where contact is made with building finishes to prevent electrolysis.

PART 3 EXECUTION

3.01 EXAMINATION
- A. Verify that site conditions are ready to receive work and dimensions are as indicated on shop drawings and instructed by the manufacturer.
- B. Verify exact location of accessories for installation. Coordinate with ADA requirements.

3.02 PREPARATION
- A. Deliver inserts and rough-in frames to site for timely installation. Provide templates and rough-in measurements as required.

3.03 INSTALLATION
- A. Install accessories in accordance with manufacturer's instructions and Americans with Disabilities Act. Also reference ANSI A117.1.
- B. Install plumb and level, securely and rigidly anchored to substrate.

3.04 SCHEDULE (**Install All Handicap Accessories per 2010 ADAAG Requirements**)
- A. Water Closet Grab Bars (Six Sets Total): Install at handicap water closet, mount 36 inches A.F.F. Bradley #812-001-36 and #812-001-42.
- B. Mirror Units: Install bottom at 40 inches A.F.F. above lavatory. Bradley #781-2436 (Four Total); Bradley #781-4647 (Four Total).
- C. Robe Hooks (Twenty-four Total): Install top of hook at 48 inches A.F.F. Bradley #9124.
- D. Surface Mounted Toilet Tissue Dispensers (Seven Total): Install one adjacent to each water closet, mount center line of roll at 24 inches A.F.F. and 7 inches from front edge of toilet. Bradley #508.
- E. Surface Mounted Soap Dispenser (Eleven Total): Install bottom of unit at 43 inches A.F.F. Bradley #6562.
- F. Surface Mounted Paper Towel Dispenser (Eleven Total): Mount bottom of unit at 48 inches A.F.F. Bradley #2A10-11

G. Surface Mounted Horizontal Baby Changing Station (One Total): Locate in Toilet #129. Mount bottom of operable portion at 27 inches A.F.F. Bradley #962-11
H. Curved Shower Curtain Rods (One Total): Locate in Bath #119. Bradley #9530-600000
I. Shower Curtain (One Total): 48”x72”. Bradley #9533
J. Shower Curtain (Five Total): 72”x72”. Bradley #9533
K. Shower Curtain Hooks (Sixty-eight Total): Bradley #9536

END OF SECTION 10800

SECTION 10850

BUILDING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building specialties shall be furnished and installed as shown and herein specified. Installation shall be in accordance with the respective manufacturer's instructions. Certain manufacturer's products have been selected as a basic standard, and reference to these products has been made. Other manufacturers' products of equal capacities and design characteristics may be used, if approved by the Architect prior to the Bidding. The Contractor shall submit for approval shop drawings or standard cuts and illustrations or a combination thereof showing all items he proposes to use.

1.02 INTERIOR ROOM SIGNAGE

A. Allowance: Contractor shall include in his bid an allowance of $2,000.00 for the purchase and delivery of interior building signage. Contractor shall include all labor and material associated with receiving and installation of signage in his base bid.

1.03 MARKERBOARD AND TACK BOARD SYSTEM

A. Magnetic Marker Boards – 3 ply construction; 24 ga. facing sheet, 3/8" particleboard Core, .0015" thick aluminum backing sheet. Matte finish.

B. Tackboards – Vinyl faced over manufacturers modular cork backing. Minimum 3/8 tackable, ½" total thickness. ASTM E 84, NFPA 255 Class A flame spread ratings.

C. Metal Trim and accessories: .062" thick aluminum alloy, size and shape as indicated. Manufacturers snap-on trim, no visible screws or exposed joints.

1. Marker Tray: Furnish the manufacturer's standard continuous, solid extrusion type aluminum marker tray with ribbed section and smoothly curved exposed ends, for each marker board.
2. Map Rail: Furnish map rail with cork insert (color to be selected) at top of each unit and complete with the following accessories.
    a. Display Rail: Provide one end stop at each end of the map rail.
    b. End Stops: Provide one end stop at each end of the map rail.
    c. Map Hooks: Provide 2 map hooks for each 4' of map rail or fraction thereof.

D. Tack Strip. 1" wide x continuous aluminum frame tack strip with cork insert (color to be selected). Provide all components for complete installation including end caps.

E. Adjustable Mounting Brackets Provided by manufacturer. Not glued to wall. Confirm mounting height with Owner. Brackets to be 6'-0" long, double slotted standards at 4'-0" o.c. Bottom of standards to start 24" A.F.F. Stand-alone tackboards may be fixed mounted with Manufacturer's standard brackets.

F. Manufacturer – Claridge Products

G. Quantity – One

H. Size – Marker Board 6' wide x 4' tall. Tack Board 4' wide x 4' tall.

1.04 PLASTIC BORDER TIMBERS

A. 1'-0"" H. x 4'-0" L x 4" W plastic border sections at perimeter of playground. Units shall be interlocking. Approximate size to be 31'x40.

B. Include 1 handicap accessible section for ADA playground access. To be provided by same manufacturer as border timbers.

C. Product equal to Tufftimbers by Landscape Structures.

D. Include all components for complete and operational assembly. Contractor shall provide all installation of the perimeter border system.

E. Product shall include a 10 year warranty on materials against defects.

1.05 PLAYGROUND MULCH

A. Soft, clean, wood fiber mulch. Certified through the International Playground Equipment Manufacturer's Association (IPEMA).

B. Product Kiddie Kushion.

C. Install 12" minimum thickness. Clean subgrade at playground area thoroughly and install landscape fabric (no plastic) at entire play area.

1.06 FIBERGLASS REINFORCED PLASTIC PANELING

A. Product - Class A – Minimum 3/32 inch thickness panel. Include Manufacturer's vinyl molding at all corners, transitions, joints, and tops, bottoms, etc.

B. Product shall be applied using manufacturer recommended adhesive and manufacturer recommended mechanical fasteners. Pre-drill rivet holes and silicone caulk prior to riveting.

C. Product shall be as per: Marlite, Symmetrix with Sani-coat, Full range of colors.

1.07 FIRE DEPARTMENT KNOX BOX

A. Provide and install a surface mounted knox box at the west side of building. Coordinate exact location with Architect and Salina Fire Department. Knox Box shall be 3262 with hinged door. Color – Aluminum. Order through Salina Fire Department.

END OF SECTION 10850

SECTION 210500

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe, fittings, valves, and connections for sprinkler systems.

1.2 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 211300 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.

1.3 REFERENCE STANDARDS

A. ASME A112.18.1 - Plumbing Supply Fittings; 2012.

B. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Qualifications; 2015.

C. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2010.

D. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2011.

E. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2011.

F. ASME B16.9 - Factory-Made Wrought Buttwelding Fittings; 2012.

G. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

H. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015.

I. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2014).

J. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2013.

K. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2013.

L. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2013a.

M. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

N. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2010.

O. AWWA C606 - Grooved and Shouldered Joints; 2011.

P. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2016.

Q. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

R. UL 262 - Gate Valves for Fire-Protection Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

S. UL 312 - Check Valves for Fire-Protection Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Division 1 Section - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturers catalogue information. Indicate valve data and ratings.

C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

D. Project Record Documents: Record actual locations of components and tag numbering.

E. Operation and Maintenance Data: Include installation instructions and spare parts lists.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Valves: Bear UL label or marking. Provide manufacturer's name and pressure rating marked on valve body.

C. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers, with labeling in place.

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.

PART 2 PRODUCTS

2.1 FIRE PROTECTION SYSTEMS

A. Sprinkler Systems: Conform work to NFPA 13.

B. Welding Materials and Procedures: Conform to ASME Code.

2.2 BURIED PIPING

A. Steel Pipe: ASTM A53/A53M Schedule 40 or ASTM A795 Standard Weight, black, with AWWA C105 polyethylene jacket, or double layer, half-lapped polyethylene tape.
   1. Steel Fittings: ASME B16.9, wrought steel, buttwelded; with double layer, half-lapped polyethylene tape.
   2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings.
   3. Joints: Welded in accordance with AWS D1.1.

2.3 ABOVE GROUND PIPING

A. Steel Pipe: ASTM A795 Schedule 10 or ASTM A53 Schedule 40, black.
   1. Steel Fittings: ASME B16.9, wrought steel, buttwelded.
   2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
   3. Malleable Iron Fittings: ASME B16.3, threaded fittings.
   4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
   5. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe.

2.4 PIPE SLEEVES

A. Vertical Piping:
   1. Sleeve Length: 1 inch above finished floor.
   2. Provide sealant for watertight joint.

B. Pipe Passing Through Below Grade Exterior Walls:
   1. Zinc coated or cast iron pipe.
   2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

C. Not required for wall hydrants for fire department connections or in drywall construction.

D. Clearances:
   1. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch greater than external; pipe diameter.
   2. All Rated Openings: Caulked tight with fire stopping material conforming to ASTM E814 in accordance with Firestopping section to prevent the spread of fire, smoke, and gases.

2.5 MANUFACTURED SLEEVE-SEAL SYSTEMS

A. Modular/Mechanical Seal:

1. Synthetic rubber interlocking links continuously fill annular space between pipe and wall/casing opening.
2. Provide watertight seal between pipe and wall/casing opening.
3. Elastomer element size and material in accordance with manufacturer's recommendations.
4. Glass reinforced plastic pressure end plates.

2.6 ESCUTCHEONS

A. Material:
1. Fabricate from nonferrous metal.
2. Chrome-plated except when 300 series, ASTM A269/A269M stainless steel is provided.
3. Metals and Finish: Comply with ASME A112.18.

B. Construction:
1. One-piece for mounting on chrome-plated tubing or pipe and one-piece or split-pattern type elsewhere.
2. Internal spring tension devices or setscrews to maintain a fixed position against a surface.

2.7 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.

C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

D. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.

E. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.

F. Vertical Support: Steel riser clamp.

G. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.8 MECHANICAL COUPLINGS

A. Rigid Mechanical Couplings for Grooved Joints:
1. Dimensions and Testing: Comply with AWWA C606.
2. Minimum Working Pressure: 300 psig.
3. Housing Material: Fabricate of ductile iron conforming to ASTM A536.
4. Housing Coating: Factory applied orange enamel.
5. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F to 230 degrees F.
6. Bolts and Nuts: Hot dipped galvanized or zinc electroplated steel

2.9 GATE VALVES

A. Up to and including 2 inches:
1. Bronze body, bronze trim, rising stem, handwheel, solid wedge or disc, threaded ends.

B. Over 2 inches:
1. Iron body, bronze trim, rising stem pre-grooved for mounting tamper switch, handwheel, OS&Y, solid rubber covered bronze or cast iron wedge, flanged ends.

C. Over 4 inches:
1. Iron body, bronze trim, non-rising stem with bolted bonnet, solid bronze wedge, flanged ends, iron body indicator post assembly.

2.10 GLOBE OR ANGLE VALVES

A. Up to and including 2 inches:
1. Bronze body, bronze trim, rising stem and handwheel, inside screw, renewable rubber disc, threaded ends, with backseating capacity repackable under pressure.

B. Over 2 inches:

1. Iron body, bronze trim, rising stem, handwheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc.

2.11 BUTTERFLY VALVES

A. Bronze Body:
   1. Stainless steel disc, resilient replaceable seat, threaded or grooved ends, extended neck, handwheel and gear drive and integral indicating device, and built-in tamper proof switch rated 10 amp at 115 volt AC.

B. Cast or Ductile Iron Body
   1. Cast or ductile iron, chrome or nickel plated ductile iron or aluminum bronze disc, resilient replaceable EPDM seat, wafer, lug, or grooved ends, extended neck, handwheel and gear drive and integral indicating device, and internal tamper switch rated 10 amp at 115 volt AC.

2.12 CHECK VALVES

A. Up to and including 2 inches:
   1. Bronze body and swing disc, rubber seat, threaded ends.

B. Over 2 inches:
   1. Iron body, bronze trim, swing check with rubber disc, renewable disc and seat, flanged ends with automatic ball check.

C. 4 inches and Over:
   1. Iron body, bronze disc, stainless steel spring, resilient seal, threaded, wafer, or flanged ends.

2.13 DRAIN VALVES

A. Compression Stop:
   1. Bronze with hose thread nipple and cap.

B. Ball Valve:
   1. Brass with cap and chain, 3/4 inch hose thread.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and foreign material, from inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.

B. The entire building shall be provided with a fire protection sprinkler system.

C. Prepare design documents including shop drawings and hydraulic calculations in accordance with NFPA 13 and submit to Authority Having Jurisdiction for approval prior to installation. Design shall be performed by a licensed Professional Engineer.

D. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

E. Install piping to conserve building space, to not interfere with use of space and other work.

F. Piping shall be concealed where routed in finished spaces.

G. Group piping whenever practical at common elevations.

H. Sleeve pipes passing through partitions, walls, and floors.

I. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

J. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

K. Pipe Hangers and Supports:
1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
2. Place hangers within 12 inches of each horizontal elbow.
3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
6. Support piping from top chord of bar joists. Support from deck or bottom chord is not acceptable.

L. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

M. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

N. Do not penetrate building structural members unless indicated.

O. Provide sleeves when penetrating footings, floors, and walls. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.
1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
2. Aboveground Piping:
a. Pack solid using mineral fiber conforming to ASTM C592.
b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
3. All Rated Openings: Caulk tight with fire stopping material conforming to ASTM E814 in accordance with Firestopping section to prevent the spread of fire, smoke, and gases.
4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.

P. Manufactured Sleeve-Seal Systems:
1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
3. Locate piping in center of sleeve or penetration.
4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
5. Tighten bolting for a water-tight seal.
6. Install in accordance with manufacturer's recommendations.

Q. Escutcheons:
1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
3. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.

R. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

S. Install valves with stems upright or horizontal, not inverted. Remove protective coatings prior to installation.

T. Provide gate valves for shut-off or isolating service.

U. Provide drain valves at main shut-off valves, low points of piping and apparatus.

END OF SECTION 210500

SECTION 210523

GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Two-piece ball valves with indicators.

B. Bronze butterfly valves with indicators.

C. Iron butterfly valves with indicators.

D. Check valves.

E. Bronze OS&Y gate valves.

F. Iron OS&Y gate valves.

G. NRS gate valves.

H. Indicator posts.

I. Trim and drain valves.

1.2 RELATED REQUIREMENTS

A. Section 210500 - Common Work Results for Fire Suppression: Pipe and fittings.

B. Section 210553 - Identification for Fire Suppression Piping and Equipment.

C. Section 211200 - Fire-Suppression Standpipes.

D. Section 211300 - Fire Suppression Sprinklers.

E. Section 283100 - Fire Detection and Alarm.

1.3 ABBREVIATIONS AND ACRONYMS

A. EPDM: Ethylene-propylene diene monomer.

B. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

C. NRS: Non-rising stem.

D. OS&Y: Outside screw and yoke.

E. PTFE: Polytetrafluoroethylene.

F. SBR: Styrene-butadiene rubber.

1.4 REFERENCE STANDARDS

A. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Qualifications; 2015.

B. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2016.

1.5 SUBMITTALS

A. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

B. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

1.6 QUALITY ASSURANCE

A. Manufacturer:

1. Obtain valves for each valve type from single manufacturer.
2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.

B. Where listed products are specified, provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), FM Global, or testing firm acceptable to authorities having jurisdiction as suitable for the purpose indicated.

C. Welding Materials and Procedures: Conform to ASME BPVC-IX.

D. Installer and Maintenance Contractor Qualifications:
   1. Company specializing in performing the work of this section with minimum five years documented experience.
   2. Trained and approved by manufacturer to design, install, test and maintain the equipment specified herein.
   3. Complies with manufacturer's certification requirements.
   4. Complies with manufacturer's insurance requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Set valves open to minimize exposure of functional surfaces.

B. Use the following precautions during storage:
   1. Maintain valve end protection and protect flanges and specialties from dirt.
      a. Provide temporary inlet and outlet caps.
      b. Maintain caps in place until installation.
   2. Store valves in shipping containers and maintain in place until installation.
      a. Store valves indoors and maintain at higher than ambient dew point temperature.
      b. If outdoor storage is unavoidable, store valves off the ground in watertight enclosures.

C. Use the following precautions for handling:
   1. Do not use operating handles or stems as lifting or rigging points.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Comply with NFPA 13 for valves.

B. Valve Pressure Ratings: Not less than minimum pressure rating indicated or higher as required.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:
   1. Worm-gear actuator with handwheel for quarter-turn valves, except trim and drain valves.
   2. Handwheel: For other than quarter-turn trim and drain valves.
   3. Hand-lever: For quarter-turn trim and drain valves 2 NPS and smaller.

2.2 TWO-PIECE BALL VALVES WITH INDICATORS

A. Description:
   1. Minimum Pressure Rating: 175 psig.
   2. Body Design: Two piece.
   3. Body Material: Forged brass or bronze.
   4. Port Size: Full or standard.
   5. Seat: PTFE.
   6. Stem: Bronze or stainless steel.
   7. Ball: Chrome-plated brass.
   8. Actuator: Worm gear or traveling nut.
   9. Supervisory Switch: Internal or external.

2.3 BRONZE BUTTERFLY VALVES WITH INDICATORS

A. Minimum Pressure Rating: 175 psig.

B. Body Material: Bronze.

C. Seat: EPDM.

D. Stem: Bronze or stainless steel.

E. Disc: Bronze with EPDM coating.

F. Actuator: Worm gear or traveling nut.

G. Supervisory Switch: Internal or external.

2.4 IRON BUTTERFLY VALVES WITH INDICATORS

A. Minimum Pressure Rating: 175 psig.

B. Body Material: Cast or ductile iron with nylon, EPDM, epoxy, or polyamide coating.

C. Seat: EPDM.

D. Stem: Stainless steel.

E. Disc: Ductile iron, nickel plated.

F. Actuator: Worm gear or traveling nut.

G. Supervisory Switch: Internal or external.

H. Body Design: Grooved-end connections.

2.5 CHECK VALVES

A. Minimum Pressure Rating: 175 psig.

B. Type: Center guided check valve.

C. Body Material: Cast iron, ductile iron.

D. Center guided check with elastomeric seal.

E. Hinge Spring: Stainless steel.

F. End Connections: Flanged, grooved, or threaded.

2.6 BRONZE OS&Y GATE VALVES

A. Minimum Pressure Rating: 175 psig.

B. Body and Bonnet Material: Bronze or brass.

C. Wedge: One-piece bronze or brass.

D. Wedge Seat: Bronze.

E. Stem: Bronze or brass.

F. Packing: Non-asbestos PTFE.

G. Supervisory Switch: External.

H. End Connections: Threaded.

2.7 IRON OS&Y GATE VALVES

A. Minimum Pressure Rating: 175 psig.

B. Body and Bonnet Material: Cast or ductile iron.

C. Wedge: Cast or ductile iron, or bronze with elastomeric coating.

D. Wedge Seat: Cast or ductile iron, or bronze with elastomeric coating.

E. Stem: Brass or bronze.

F. Packing: Non-asbestos PTFE.

G. Supervisory Switch: External.

H. End Connections: Flanged.

2.8 NRS GATE VALVES

A. Minimum Pressure Rating: 175 psig.

B. Body and Bonnet Material: Cast or ductile iron.

C. Wedge: Cast or ductile iron with elastomeric coating.

D. Stem: Brass or bronze.

E. Packing: Non-asbestos PTFE.

F. Supervisory Switch: External.

G. End Connections: Flanged.

2.9 INDICATOR POSTS

A. Type: Underground.

B. Base Barrel Material: Cast or ductile iron.

C. Cap: Cast or ductile iron.

D. Operation: Wrench.

2.10 TRIM AND DRAIN VALVES

A. Ball Valves:
   1. Description:
      a. Pressure Rating: 175 psig.
      b. Body Design: Two piece.
      c. Body Material: Forged brass or bronze.
      d. Port Size: Full or standard.
      e. Seat: PTFE.
      f. Stem: Bronze or stainless steel.
      g. Ball: Chrome-plated brass.
      h. Actuator: Hand-lever.

B. Angle Valves:
   1. Description:
      a. Pressure Rating: 175 psig.
      b. Body Material: Brass or bronze.
      c. Ends: Threaded.
      d. Stem: Bronze.
      e. Disc: Bronze.
      f. Packing: Asbestos free.
      g. Handwheel: Malleable iron, bronze, or aluminum.

C. Globe Valves:
   1. Description:
      a. Pressure Rating: 175 psig.
      b. Body Material: Bronze with integral seat and screw-in bonnet.
      c. Ends: Threaded.
      d. Stem: Bronze.
      e. Disc Holder and Nut: Bronze.
      f. Disc Seat: Nitrile.
      g. Packing: Asbestos free.
      h. Handwheel: Malleable iron, bronze, or aluminum.

PART 3 EXECUTION

3.1 EXAMINATION

A. Confirm valve interior to be free of foreign matter and corrosion.

B. Remove packing materials.

C. Examine guides and seats by operating valves from the fully open position to the fully closed position.

D. Examine valve threads and mating pipe for form and cleanliness.

3.2 INSTALLATION

A. Comply with specific valve installation requirements and application in the following Sections:
   1. Section 211300 for application of valves in wet and dry pipe, fire-suppression sprinkler systems.

B. Install listed fire protection shutoff valves supervised-open, located to control sources of water supply except from fire department connections.
   1. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in water supply connections and backflow preventer at potable water supply connections.

D. Valves in horizontal piping installed with stem at or above the pipe center.

E. Position valves to allow full stem movement.

F. Install valve tags. Comply with Section 210553 requirements for valve tags, schedules, and signs on surfaces concealing valves; and the appropriate NFPA standard applying to the piping system in which valves are installed.

END OF SECTION 210523

SECTION 210553

IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Stencils.

D. Pipe Markers.

1.2 REFERENCE STANDARDS

1.3 SUBMITTALS

A. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

B. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

C. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.1 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.

2.2 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.3 STENCILS

A. Stencils: With clean cut symbols and letters of following size:

1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.
4. Equipment: 2-1/2 inch high letters.

2.4 PIPE MARKERS

A. 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.

B. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

C. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.5 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

F. Use tags on piping 3/4 inch diameter and smaller.

G. Locate ceiling tacks to locate valves above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION 210553

SECTION 211300

FIRE SUPPRESSION SPRINKLERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wet-pipe sprinkler system.

B. System design, installation, and certification.

C. Fire department connections.

1.2 RELATED REQUIREMENTS

A. Section 210500 - Common Work Results for Fire Suppression: Pipe, fittings, and valves.

B. Section 220553 - Identification for Plumbing Piping and Equipment.

1.3 REFERENCE STANDARDS

A. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.

B. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2012.

C. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2012.

D. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2013.

E. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2013.

F. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.4 SUBMITTALS

A. See Division 1 Section - Administrative Requirements, for submittal procedures.

B. 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.

C. Shop Drawings:

1. Submit preliminary layout of all areas indicating only sprinkler locations and types coordinated with other work. Additionally, indicate general routing of piping for review by Architect.
2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.
3. Submit shop drawings, product data, and hydraulic calculations to authority having jurisdiction for approval. Drawings and calculations shall be stamped by a licenced professional engineer.
4. Installation shall be fully coordinated with structure and all other trades. Coordination shall be performed with installed conditions, not just the construction drawings. Rework of sprinkler piping due to conflicts with field conditions shall be performed without cost to the Owner or Engineer.

D. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

E. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

1.5 QUALITY ASSURANCE

A. Maintain one copy of referenced design and installation standard on site.

B. Conform to UL requirements.

C. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in Kansas.

D. Equipment and Components: Provide products that bear UL label or marking.

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

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.7 EXTRA MATERIALS

A. Provide extra sprinklers of type and size matching those installed, in quantity required by referenced NFPA design and installation standard.

B. Provide suitable wrenches for each sprinkler type.

C. Provide metal storage cabinet located adjacent to alarm valve.

PART 2 PRODUCTS

2.1 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for entire building.

B. Occupancy: 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 at locations coordinated with Fire Department.

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:
1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
6. Other Types: As required.

2.2 SPRINKLERS

A. Suspended Ceiling Type: Standard pendant type with matching push on escutcheon.
1. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

B. Exposed Area Type: Standard upright type with guard.
1. Finish: Brass.
2. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

C. Sidewall Type: Standard horizontal sidewall type with matching push on escutcheon plate .
1. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

D. Guards: Finish to match sprinkler finish.
1. Provide guards at all heads in basement, mechanical rooms, and storage rooms.
2. Provide guards at all heads installed below 8' AFF.

E. Finish:
1. Heads and escutcheons in finished spaces hall have polished chrome finish.

2.3 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm and electric alarm, with pressure retard chamber and variable pressure trim; with test and drain valve.

B. Backflow Preventer: Double check valve assembly backflow preventer with drain and OS & Y gate valve on each end. Coordinate requirements with Authority Having Jurisdiction.

C. Test Connections:

1. Inspector's Test Connection for Preaction Systems:
    a. Provide test connections approximately 6 ft above floor for each or portion of each sprinkler system equipped with an alarm device, located at the most remote part of each system.
    b. Route test connection to an open-site drain location, excluding janitor sinks, accepting full flow without negative consequences.
    c. Supply discharge orifice with same size as corresponding sprinkler orifice.
2. Backflow Preventer Test Connection:
    a. Provide downstream of the backflow prevention assembly, listed hose valves with 2.5 inch National Standard male hose threads with cap and chain.

D. Electric Alarm: Electrically operated chrome plated gong with pressure alarm switch.

E. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.

F. Fire Department Connections:
1. Type: Flush mounted wall type with chrome plated finish.
2. Outlets: Two way with thread size to suit fire department hardware; threaded dust cap and chain of matching material and finish.
3. Drain: 3/4 inch automatic drip, outside.
4. Label: "Auto. Sprinkler".

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

B. Install equipment in accordance with manufacturer's instructions.

C. Install buried shut-off valves in valve box. Provide post indicator.

D. Provide approved backflow preventer assembly at sprinkler system water source connection.

E. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle. Coordinate with Authority Having Jurisdiction.

F. Place pipe runs to minimize obstruction to other work.

G. Place piping in concealed spaces above finished ceilings.

H. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.

I. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

J. Flush entire piping system of foreign matter.

K. Install guards on sprinklers where subject to damage..

L. Hydrostatically test entire system.

M. Required tests must be witnessed by authority having jurisdiction.

N. Areas subject to freezing shall be provided with dry type heads.

3.2 INTERFACE WITH OTHER PRODUCTS

A. Ensure required devices are installed and connected as required to fire alarm system.

END OF SECTION 211300

SECTION 220501

PLUMBING DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Plumbing demolition.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify field measurements, pipe, and equipment arrangements for new work as shown on Drawings.

B. Prior to submitting bid, visit site and become familiar with scope of demolition work required to accommodate new work.

C. Refer to Architectural Drawings for additional clarification of scope of demolition and new work.

D. Verify that abandoned equipment and associated plumbing installation serve only abandoned facilities.

E. Demolition drawings are based on record drawings and casual field observation .

F. Report discrepancies to Architect before disturbing existing installation.

G. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

A. Remove all piping, fixtures, and other plumbing installation from entire building.

B. Coordinate utility service outages with respective utility company.

C. Provide temporary connections as required to maintain existing systems in service during construction.

D. Restore services to items not being removed, but affected by the demolition work required for new construction.

3.3 DEMOLITION AND EXTENSION OF EXISTING PLUMBING WORK

A. Remove, relocate, and extend existing installations to accommodate new construction.

B. Remove all equipment, controls, piping, fixtures, and other plumbing installation from the entire building. Piping to be removed to source of supply.

C. Repair adjacent construction and finishes damaged during demolition and extension work.

D. Maintain access to existing installations that remain active. Modify installation or provide access panels as appropriate.

3.4 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment that remain or that are to be reused.

END OF SECTION 220501

SECTION 220553

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe Markers.

1.2 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.

1.3 SUBMITTALS

A. See Division 1 Section - Administrative Requirements, for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Product Data: Provide manufacturers catalog literature for each product required.

E. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.1 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.
   1. Letter Color: White.
   2. Letter Height: 1/4 inch.
   3. Background Color: Black.

2.2 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

C. Chart: Typewritten letter size list in anodized aluminum frame.

2.3 PIPE MARKERS

A. Comply with ASME A13.1.

B. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Identify equipment with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

F. Identify control panels and major control components outside panels with plastic nameplates.

G. Identify valves in main and branch piping with tags.

H. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION 220553

SECTION 220719

PLUMBING PIPING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.2 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.

B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2013).

C. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2013).

D. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2014.

E. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2015.

F. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2013).

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

H. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service

B. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

PART 2 PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2 GLASS FIBER

A. Manufacturers:
   1. Knauf Insulation: www.knaufusa.com.
   2. Johns Manville Corporation: www.jm.com.
   3. Owens Corning Corp: www.owenscorning.com.
   4. CertainTeed Corporation: www.certainteed.com.

B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
   1. 'K' value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum service temperature: 250 degrees F.
   3. Maximum moisture absorption: 0.2 percent by volume.

C. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
   1. 'K' value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum service temperature: 250 degrees F.
   3. Maximum moisture absorption: 0.2 percent by volume.

D. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

E. Vapor Barrier Lap Adhesive:
   1. Compatible with insulation.

F. Insulating Cement/Mastic:
   1. ASTM C195; hydraulic setting on mineral wool.

G. Fibrous Glass Fabric:
   1. Cloth: Untreated; 9 oz/sq yd weight.
   2. Blanket: 1.0 lb/cu ft density.
   3. Weave: 5x5.

H. Indoor Vapor Barrier Finish:
   1. Cloth: Untreated; 9 oz/sq yd weight.
   2. Vinyl emulsion type acrylic, compatible with insulation, black color.

I. Insulating Cement:
   1. ASTM C449/C449M.

2.3 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:
   1. Armacell International: www.armacell.com/#sle.
   2. K-Flex USA: www.kflexusa.com.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534 Grade 1; use molded tubular material wherever possible.
   1. Minimum Service Temperature: -40 degrees F.
   2. Maximum Service Temperature: 220 degrees F.
   3. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.4 JACKETS

A. PVC Plastic.
   1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F.
      b. Maximum Service Temperature: 150 degrees F.
      c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
      d. Thickness: 10 mil.
      e. Connections: Brush on welding adhesive.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

D. Glass fiber insulated pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive.

2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

E. Glass fiber insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

F. Inserts and Shields:
   1. Application: Piping 2-1/2 inches diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert location: Between support shield and piping and under the finish jacket.

G. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Firestopping Section.

H. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Provide PVC jacket.

3.3 SCHEDULES

A. Domestic Hot and Recirculated Hot Water:
   1. Glass Fiber Insulation:
      a. Pipe Size Range: 1/2 through 1-1/4 inch.
      b. Thickness: 1 inch.
   2. Glass Fiber Insulation:
      a. Pipe Size Range: Above 1-1/4 inch
      b. Thickness: 1-1/2 inch

B. Domestic Cold Water:
   1. Glass Fiber Insulation:
      a. Pipe Size Range: 1/2 through 1-1/4 inch.
      b. Thickness: 1/2 inch.
   2. Glass Fiber Insulation:
      a. Pipe Size Range: Above 1-1/4 inch
      b. Thickness: 1 inch

C. Other Systems:
   1. Drains from water coolers: 1/2" elastomeric

END OF SECTION 220719

SECTION 221005

PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for piping systems.
   1. Sanitary sewer.
   2. Domestic water.
   3. Gas.
   4. Flanges, unions, and couplings.
   5. Pipe hangers and supports.
   6. Valves.
   7. Flow controls.
   8. Check valves.
   9. Water pressure reducing valves.
   10. Relief valves.
   11. Sleeves
   12. Sleeve seals
   13. Grout
   14. Escutcheons

1.2 RELATED REQUIREMENTS

A. Section - Firestopping.

B. Section 220553 - Identification for Plumbing Piping and Equipment.

C. Section 220719 - Plumbing Piping Insulation.

1.3 REFERENCE STANDARDS

A. ANSI Z21.22 - American National Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems; 1999, and addenda A&B (R2004).

B. ANSI Z223.1 - National Fuel Gas Code; 2015.

C. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2011.

D. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.

E. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.

F. ASME B31.1 - Power Piping; 2014.

G. ASME B31.9 - Building Services Piping; 2014.

H. ASSE 1003 - Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems; 2009.

I. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

J. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2015.

K. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2015.

L. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).

M. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2015a.

N. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.

O. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2010.

P. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2002 (Reapproved 2010).

Q. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012.

R. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2014.

S. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.

T. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2010).

U. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing; 2013a.

V. ASTM F877 - Standard Specification for Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems; 2011.

W. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 1992 (Reapproved 2008).

X. ASTM F 2389-06 - Standard Specification for Pressure-rated Polypropylene (PP) Piping Systems

Y. CSA B137.11 - Polypropylene (PP-R) Pipe and Fittings for Pressure Applications

Z. NSF/ANSI 14 - Plastic Piping System Components and Related Materials

AA. NSF/ANSI 61 - Drinking Water Systems Components - Health Effects

AB. AWWA C550 - Protective Interior Coatings for Valves and Hydrants; 2013.

AC. AWWA C651 - Disinfecting Water Mains; 2005.

AD. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; 2009.

AE. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2011.

AF. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2012.

AG. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.

AH. MSS SP-67 - Butterfly Valves; 2011.

AI. MSS SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends; 2011.

AJ. MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends; 2011.

AK. MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends; 2011.

AL. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.

AM. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.

AN. NSF 372 - Drinking Water System Components - Lead Content; 2011.

1.4 SUBMITTALS

A. See Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

C. Project Record Documents: Record actual routing of piping. Record actual locations of valves.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with City of Salina standards.

B. Where joining systems specific to a piping manufacturer are used, personnel shall receive factory authorized training prior to installation, and submit evidence of such training for review.

C. Valves: Manufacturer's name and pressure rating marked on valve body.

D. Welding Materials and Procedures: Conform to ASME BPVC-IX and applicable state labor regulations.

E. Welder Qualifications: Certified in accordance with ASME BPVC-IX.

F. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.6 REGULATORY REQUIREMENTS

A. Perform Work in accordance with State of Kansas, plumbing code.

B. Conform to applicable code for installation of backflow prevention devices.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

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.

1.8 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

B. Reference PART 3 EXECUTION for product applications. Listing of products herein does not imply acceptance of use in all sizes or locations.

2.2 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. PVC Pipe: ASTM D2665 or ASTM D3034.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.3 SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

B. PVC Pipe: ASTM D2729.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.4 WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Copper Pipe: ASTM B42, hard drawn.
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
   2. Joints: ASTM B 32, alloy Sn95 solder.

B. PE Pipe: ASTM D2239, or ASTM D2447 Schedule 40.
   1. Fittings: ASTM D2609, PE.
   2. Joints: Mechanical with stainless steel clamp.

2.5 WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B32, alloy Sn95 solder.

B. Polyethylene Pipe (PEX): ASTM F 1281 or ASTM F 1282, tested for potable water and residual chlorine use. PEX piping shall be straight lengths where exposed, coiled PEX is not acceptable.
   1. Fittings and Joints: Brass compression type.

C. Polypropylene Pipe (PP-R): Pipe shall be manufactured from a PP-R resin meeting the short-term properties and long-term strength requirements of ASTM F 2389. The pipe shall contain no rework or recycled materials except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All pipe shall be made in a three layer extrusion process. Domestic hot water shall contain a fiber layer (faser) to restrict thermal expansion. All pipe shall comply with the rated pressure requirements of ASTM F 2389. All pipe shall be certified by NSF International as complying with NSF 14, NSF 61, and ASTM F 2389 or CSA B137.11.
   1. Pipe shall be aquatherm® Greenpipe®, Faser®, or available from Aquatherm, Inc.. Piping specifications and ordering information are available at www.aquathermpipe.com.
   2. Fittings shall be manufactured from a PP-R resin meeting the short-term properties and long-term strength requirements of ASTM F 2389. The fittings shall contain no rework or recycled materials except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All fittings shall be certified by NSF International as complying with NSF 14, NSF 61, and ASTM F 2389 or CSA B137.11.
   3. Valves with PP-R bodies shall be manufactured from a PP-R resin meeting the short-term properties and long-term strength requirements of ASTM F 2389. The valves shall contain no rework or recycled materials except that generated in the manufacturer's own plant from resin of the same specification from the same raw material.
   4. Manufacturer shall warrantee pipe and fittings for 10 years to be free of defects in materials or workmanship. Warrantee shall cover labor and material costs of repairing and/or replacing defective materials and repairing any incidental damage caused by failure of the piping system do to defects in materials or workmanship.
   5. Where up to 1 inch of standard insulation is indicated on the drawings or in these specifications, a field installed, thermal (radiant, conductive, and convective) and vapor barrier insulation shall be provided for all straight lengths of pipe. The thick wall, self insulating fittings do not require an additional vapor barrier for the piping system to meet this performance level. Where up to 1.5 inches of standard inches of insulation is indicated on the drawings or in these specifications, a field installed, thermal (radiant, conductive, and convective) and vapor barrier insulation shall be provided for all straight lengths of pipe and all fittings. The thermal barrier is UV resistant, CFC-free, non-porous, non-fibrous, and resist mold growth. The pipe with the integral thermal barrier with standard unprotected fittings shall meet the ASTM E84 and the CSA/ULc S102 requirements for a Flame Spread Rating of 25 and Smoke Development rating of 50.

D. Mechanical joint system: Manufacturer's fittings and joining methods, for pipe materials and sizes.
   1. Viega

2.6 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
   2. Joints: Threaded or welded to ASME B31.1.

2.7 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches and Under:
   1. Ferrous pipe: Class 150 malleable iron threaded unions.
   2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.8 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
   3. Trapeze Hangers: Welded steel channel frames attached to structure.
   4. Vertical Pipe Support: Steel riser clamp.

B. Plumbing Piping - Drain, Waste, and Vent:
   1. Conform to ASME B31.9.
   2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Carbon steel, adjustable swivel, split ring.
   3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
   6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
   7. Vertical Support: Steel riser clamp.

C. Plumbing Piping - Water:
   1. Conform to ASME B31.9.
   2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
   3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   4. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.
   5. Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.
   6. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded supports or spacers and hanger rods, cast iron roll.
   7. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
   8. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
   9. Vertical Support: Steel riser clamp.

D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
   1. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
   2. Other Types: As required.

2.9 GATE VALVES

A. Manufacturers:
   1. Tyco Flow Control: www.tycoflowcontrol.com.
   2. Conbraco Industries: www.conbraco.com.
   3. Nibco, Inc: www.nibco.com.
   4. Milwaukee Valve Company: www.milwaukeevalve.com.
   5. Substitutions: See Section 016000 - Product Requirements.

B. Up To and Including 3 Inches:
   1. 1, Class 125, bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, solder ends.

C. 2 Inches and Larger:
   1. 1, Class 125, iron body, bronze trim, outside screw and yoke, handwheel, solid wedge disc, flanged ends. Provide chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

2.10 BALL VALVES

A. Manufacturers:
   1. Tyco Flow Control: www.tycoflowcontrol.com.
   2. Conbraco Industries: www.conbraco.com.
   3. Nibco, Inc: www.nibco.com.
   4. Milwaukee Valve Company: www.milwaukeevalve.com.
   5. Substitutions: See Section 016000 - Product Requirements.

B. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder ends with union.

2.11 PLUG VALVES

A. Construction 2-1/2 Inches and Larger: 1, 175 psi CWP, cast iron body and plug, pressure lubricated, teflon or Buna N packing, flanged or grooved ends. Provide lever operator with set screw.

2.12 BUTTERFLY VALVES

A. Manufacturers:
   1. Tyco Flow Control: www.tycoflowcontrol.com.
   2. Hammond Valve: www.hammondvalve.com.
   3. Crane Co.: www.cranevalve.com.
   4. Milwaukee Valve Company: www.milwaukeevalve.com.
   5. Substitutions: See Section 016000 - Product Requirements.

B. Construction 1-1/2 Inches and Larger: MSS SP-67, 200 psi CWP, cast or ductile iron body, nickel-plated ductile iron disc, resilient replaceable EPDM seat, wafer ends, extended neck, 10 position lever handle.

C. Provide gear operators for valves 8 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.

2.13 FLOW CONTROLS

A. Manufacturers:
   1. Tyco Flow Control: www.tycoflowcontrol.com.
   2. ITT Bell & Gossett: www.bellgossett.com.
   3. Griswold Controls: www.griswoldcontrols.com.
   4. Taco, Inc: www.taco-hvac.com.

B. 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.

C. 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.

2.14 SWING CHECK VALVES

A. Manufacturers:
   1. Tyco Flow Control: www.tycoflowcontrol.com.
   2. Hammond Valve: www.hammondvalve.com.
   3. Nibco, Inc: www.nibco.com.
   4. Milwaukee Valve Company: www.milwaukeevalve.com.
   5. Substitutions: See Section 016000 - Product Requirements.

B. Up to 2 Inches:
   1. 1, Class 125, bronze body and cap, bronze swing disc with rubber seat, solder ends.

C. Over 2 Inches:
   1. 1, Class 125, iron body, bronze swing disc, renewable disc seal and seat, flanged or grooved ends.

2.15 SPRING LOADED CHECK VALVES

A. Manufacturers:
   1. Tyco Flow Control: www.tycoflowcontrol.com.
   2. Hammond Valve: www.hammondvalve.com.
   3. Crane Co.: www.cranevalve.com.
   4. Milwaukee Valve Company: www.milwaukeevalve.com.

B. Class 125, iron body, bronze trim, stainless steel springs, bronze disc, Buna N seals, wafer style ends.

2.16 WATER PRESSURE REDUCING VALVES

A. Manufacturers:
   1. Amtrol Inc: www.amtrol.com.
   2. Cla-Val Co: www.cla-val.com.
   3. Watts Regulator Company: www.wattsregulator.com.

B. Up to 2 Inches:
   1. ASSE 1003, bronze body, stainless steel, and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.

C. Over 2 Inches:
1. ASSE 1003, cast iron body with interior lining complying with AWWA C550, bronze fitted, elastomeric diaphragm and seat disc, flanged.

2.17 RELIEF VALVES

A. Temperature and Pressure Relief:
1. Manufacturers:
a. Cla-Val Co: www.cla-val.com.
b. Henry Technologies: www.henrytech.com.
c. Watts Regulator Company: www.wattsregulator.com.
2. AGA Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME (BPV IV) certified and labelled.

2.18 SLEEVES

A. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

2.19 SLEEVE-SEAL SYSTEMS

A. 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:

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.20 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.21 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

D. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.

E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, exposed-rivet hinge, and spring-clip fasteners.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 220719.

H. Provide access where valves and fittings are not exposed.

I. Install vent piping penetrating roofed areas to maintain integrity of roof assembly.

J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

K. Provide support for utility meters in accordance with requirements of utility companies.

L. TRENCHING
   1. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
   2. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.
   3. Do not interfere with 45 degree bearing splay of foundations.
   4. Cut trenches wide enough to allow inspection of installed utilities.
   5. Hand trim excavations. Remove loose matter.
   6. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.
   7. Remove excavated material that is unsuitable for re-use from site.
   8. Remove excess excavated material from site.

M. BACKFILLING
   1. Fill up to subgrade elevations unless otherwise indicated.
   2. Employ a placement method that does not disturb or damage other work.
   3. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
   4. Maintain optimum moisture content of fill materials to attain required compaction density.
   5. Sand Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

N. Install bell and spigot pipe with bell end upstream.

O. Install valves with stems upright or horizontal, not inverted.

P. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.

Q. Install water piping to ASME B31.9.

R. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

S. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

T. Do not use PVC piping in return air plenums.

U. PP Piping: Install fittings and joints using socket-fusion, elecrofusion, or butt-fusion as applicable for the fitting type. All fusion-well joints shall be made in accordance with the pipe and fitting manufacturer's specifications and product standards.

V. The use of PEX piping shall be limited to 1" and smaller unless noted otherwise.

W. SLEEVE INSTALLATION
   1. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
   2. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
      a. Sleeves are not required for core-drilled holes.
   3. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
      a. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
      b. Cut sleeves to length for mounting flush with both surfaces.
         1) Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
      c. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
   4. Install sleeves for pipes passing through interior partitions.
      a. Cut sleeves to length for mounting flush with both surfaces.
      b. Install sleeves that are large enough to provide 1/4-inchannular clear space between sleeve and pipe or pipe insulation.
      c. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in other sections.
   5. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in other sections.

X. SLEEVE-SEAL-SYSTEM INSTALLATION
   1. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
   2. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

Y. ESCUTCHEONS
   1. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
   2. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.
      a. Escutcheons Schedule:
         1) Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
         2) Insulated Piping: One-piece, stamped-steel type or split-plate, stamped-steel type with exposed-rivet hinge.
         3) Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
         4) Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
         5) Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with exposed-rivet hinge.
         6) Bare Piping in Equipment Rooms: One-piece, stamped-steel type or split-plate, stamped-steel type with exposed-rivet hinge.

Z. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
   4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

AA. Pipe Hangers and Supports:
1. Install in accordance with ASME B31.9.
2. Support horizontal piping as scheduled.
3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
7. Provide copper plated hangers and supports for copper piping.
8. Provide hangers adjacent to motor driven equipment with vibration isolation; refer to Section 220548.
9. Support cast iron drainage piping at every joint.

3.4 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

C. Install gate or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

D. Provide spring loaded check valves on discharge of water pumps.

E. Provide flow controls in water recirculating systems where indicated.

3.5 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/8 inch per foot slope.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed and clean.

B. Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.7 SCHEDULES

A. Pipe Hanger Spacing:
1. Metal Piping:
a. Pipe size: 1/2 inches to 1-1/4 inches:
1) Maximum hanger spacing: 6.5 ft.
2) Hanger rod diameter: 3/8 inches.
b. Pipe size: 1-1/2 inches to 2 inches:
1) Maximum hanger spacing: 10 ft.
2) Hanger rod diameter: 3/8 inch.
c. Pipe size: 2-1/2 inches to 3 inches:
1) Maximum hanger spacing: 10 ft.
2) Hanger rod diameter: 1/2 inch.

d. Pipe size: 4 inches to 6 inches:
1) Maximum hanger spacing: 10 ft.
2) Hanger rod diameter: 5/8 inch.

2. Plastic Piping:
a. All Sizes:
1) Maximum hanger spacing: 6 ft.
2) Hanger rod diameter: 3/8 inch.

B. Pipe Materials:
1. Domestic Water:
a. Stubouts to fixtures shall be copper.
b. Pipe sizes 1/2" to 1": Any material listed for use in Part 2.
c. Pipe sizes 1-1/4" and larger: Any material listed for use in Part 2, except PEX is not acceptable.

2. Sanitary Drain and Vent: Any material listed for use in Part 2.
a. PVC shall not be used in return air plenums.

3. Natural Gas: Any materials listed for use in Part 2.

END OF SECTION 221005

SECTION 221006

PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cleanouts.

B. Water hammer arrestors.

C. Mixing valves.

D. Interceptors.

E. Thermostatic mixing valves.

1.2 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASSE 1012 - Backflow Preventer with Intermediate Atmospheric Vent; 2009.

C. PDI-WH 201 - Water Hammer Arresters; 2010.

1.3 SUBMITTALS

A. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

B. Certificates: Certify that grease interceptors meet or exceed specified requirements.

PART 2 PRODUCTS

2.1 CLEANOUTS

A. Manufacturers:
   1. Jay R. Smith Manufacturing Company: www.jayrsmith.com/#sle.
   2. Josam Company: www.josam.com/#sle.
   3. Zurn Industries, Inc: www.zurn.com/#sle.
   4. Sioux Chief Manufacturing.

B. Cleanouts at Exterior Surfaced Areas:
   1. Round cast nickel bronze access frame and non-skid cover.

C. Cleanouts at Exterior Unsurfaced Areas:
   1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.

D. Cleanouts at Interior Finished Floor Areas (FFCO):
   1. Lacquered cast iron body with anchor flange, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

E. Cleanouts at Interior Finished Wall Areas (FWCO):
   1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

F. Cleanouts at Interior Unfinished Accessible Areas: Caulked or threaded type.

2.2 BACKFLOW PREVENTERS

A. Manufacturers:
   1. Conbraco Industries: www.conbraco.com/#sle.
   2. Watts Regulator Company: www.wattsregulator.com/#sle.
   3. Zurn Industries, Inc: www.zurn.com.

B. Reduced Pressure Backflow Preventers:
   1. ASSE 1013; bronze body with bronze internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

2.3 DOUBLE CHECK VALVE ASSEMBLIES

A. Manufacturers:
   1. Conbraco Industries: www.conbraco.com/#sle.
   2. Watts Regulator Company: www.wattsregulator.com/#sle.
   3. Zurn Industries, Inc: www.zurn.com/#sle.

B. Double Check Valve Assemblies:
   1. ASSE 1012; Bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.

2.4 WATER HAMMER ARRESTORS

A. Manufacturers:
   1. Sioux Chief Manufacturing

B. Water Hammer Arrestors:
   1. Stainless steel or Copper construction, piston type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range 34 to 250 degrees F and maximum 150 psi working pressure.

2.5 MIXING VALVES

A. Thermostatic Mixing Valves:
   1. Accessories:
      a. Check valve on inlets.
      b. Volume control shut-off valve on outlet.
      c. Stem thermometer on outlet.
      d. Strainer stop checks on inlets.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Install approved portable water protection devices on plumbing lines where contamination of domestic water may occur.

F. Pipe relief from backflow preventer to nearest drain.

G. Install water hammer arrestors on cold water supply piping to flush valve or solenoid operated fixtures. .

H. Install cleanouts at locations required by the International Plumbing Code (IPC), whether or not specifically indicated on the drawings. Such locations include, but are not limited to the following:
   1. Base of waste or soil stacks.
   2. Junction of building drain and building sewer (utilize 2-way cleanout at this location).

END OF SECTION 221006

SECTION 223000

PLUMBING EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Diaphragm-type compression tanks.

B. Sump pumps.

C. Sanitary Sewage Pumps:
   1. Centrifugal solids handling.

D. Water heaters.

E. Pumps.
   1. Circulators.

1.2 REFERENCE STANDARDS

A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015.

B. ABMA STD 11 - Load Ratings and Fatigue Life for Roller Bearings; 2014.

1.3 REFERENCE STANDARDS

A. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; The American Society of Mechanical Engineers; 2013.

B. ICC (IPC) - International Plumbing Code; 2012.

C. UL 174 - Standard for Household Electric Storage Tank Water Heaters; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

D. UL 778 - Standard for Motor-Operated Water Pumps; Current Edition, Including All Revisions.

E. UL 1453 - Standard for Electric Booster and Commercial Storage Tank Water Heaters; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. Product Data:
   1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
   2. Indicate pump type, capacity, power requirements.
   3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
   4. Provide electrical characteristics and connection requirements.

B. Shop Drawings:
   1. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.

C. Project Record Documents: Record actual locations of components.

D. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

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

B. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.

C. Performance: Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

1.6 CERTIFICATIONS

A. Water Heaters: NSF approved.

B. Electric Water Heaters: UL listed and labeled to UL 174 or UL 1453.

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

1.7 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.8 WARRANTY

A. Provide five year manufacturer warranty for domestic water heaters.

PART 2 PRODUCTS

2.1 WATER HEATER MANUFACTURERS

A. A.O. Smith Water Products Co: www.hotwater.com.

B. Rheem Manufacturing Company: www.rheem.com.

2.2 GAS FIRED STORAGE WATER HEATERS

A. Type: Automatic, natural gas-fired, vertical storage.

B. Performance: As indicated on drawings.

C. Tank: Glass lined welded steel with single flue passage, flue baffle and draft hood; thermally insulated and encased in corrosion-resistant steel jacket; baked-on enamel finish; floor shield and legs.
   1. Insulation: Glass fiber.

D. Controls: Automatic water thermostat and built-in gas pressure regulator; temperature range adjustable from 120 to 170 degrees F, cast iron or sheet metal burner, safety pilot and thermocouple.

E. Accessories: Provide:
   1. Water Connections: Brass.
   2. Dip Tube: Brass.
   3. Drain Valve.
   4. Anode: Magnesium.
   5. Temperature and Pressure Relief Valve: ASME labelled.

2.3 DIAPHRAGM-TYPE COMPRESSION TANKS

A. Manufacturers:
   1. Amtrol Inc: www.amtrol.com/#sle.
   2. ITT Bell & Gossett: www.bellgossett.com.
   3. Taco, Inc: www.taco-hvac.com.

B. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 125 psig, with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.

C. Accessories: Pressure gage and air-charging fitting, tank drain; precharge to 12 psig.

2.4 IN-LINE CIRCULATOR PUMPS

A. Casing: Bronze, rated for 125 psig working pressure, with stainless steel rotor assembly.

B. Impeller: Bronze.

C. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.

D. Seal: Carbon rotating against a stationary ceramic seat.

E. Drive: Flexible coupling.

2.5 SUBMERSIBLE SUMP PUMPS

A. Type: Completely submersible, vertical, centrifugal.

B. Casing: Cast iron pump body and oil filled motor chamber.

C. Impeller: Cast iron; open non-clog, stainless steel shaft.

D. Bearings: Ball bearings.

E. Sump: Fiberglass basin with steel cover plate, dimensions as indicated on drawings.

F. Accessories: Oil resistant 6 foot cord and plug with three-prong connector for connection to electric wiring system including grounding connector.

2.6 SANITARY SEWAGE PUMPS

A. Centrifugal Solids Handling:
   1. General: Non-clogging centrifugal type suitable for pumping solids up to 3 inches in diameter without internal interstices that can collect stringy materials and solids resulting in clogging.
   2. Casing:
      a. Capable of withstanding operating pressures 50 percent greater than the maximum operating pressure.
      b. Plugged and tapped holes for draining and venting pump.
      c. Volute to consist of smooth passages.
      d. Configuration to permit removal of impeller without disturbing discharge and suction connections.
      e. Handhole to allow cleaning and inspection of pump interior.
      f. Lifting eyes to facilitate handling of pump.
   3. Impeller:
      a. Design to consist of smooth passages to prevent clogging and pass fibrous or stringy material.
      b. Securely keyed to shaft with locking arrangement preventing loosening by torque from either forward or reverse direction.
      c. Balance statically, dynamically, and hydraulically within the operating range and to the first critical speed at 150 percent of the maximum operating speed.
   4. Wearing Rings:
      a. Provide renewable wearing rings on the casing and impeller with wearing surfaces normal to the axis of rotation.
      b. Construction: Cast iron.
      c. Factory designed for simple maintenance and secured to prevent rotation.
      d. In lieu of wearing rings on impeller and casing, replaceable steel wear plates fastened to casing may be used.
   5. Pump Shaft:
      a. Provide with adequate size and strength to transmit full driver horsepower with liberal safety factor.
      b. Fabricate from stainless steel.
   6. Pump Shaft Sleeve:
      a. Fabricate from stainless steel.
      b. Seal joint between shaft and sleeve to prevent leakage.
      c. Stuffing Box:
         1) Factory designed for minimum 5 rings of packing with removable split type glands.
         2) Fabricate from same material as casing and water sealed.
   7. Mechanical Seal System:
      a. Furnish single seals to seal pump shaft against leakage.
      b. Each seal to be held in place by its own spring system, supplemented by external liquid pressures.
      c. System to be readily removable from the shaft.
   8. Bearings:

a. Provide ball type designed to handle all thrust loads in either direction.
b. Furnish with a L-10 life of minimum 50,000 hours as required by ABMA 9 or ABMA 11.
c. Pumps depending only on hydraulic balance and thrust are not acceptable.

9. Lubrication:
   a. Bearing:
10. Pump Support:
11. Coupling:
    a. Provide heavy duty, flexible type, locked to the shaft.
    b. Disconnection of the coupling possible without removing the driver half or the pump half of the coupling from the shaft.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.

B. Coordinate with plumbing piping and related fuel piping work to achieve operating system.

C. Pumps:
   1. Provide line sized isolating valve and strainer on suction and line sized soft seated check valve and balancing valve on discharge.
   2. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. Provide supports under elbows on pump suction and discharge line sizes 4 inches and over.
   3. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

END OF SECTION 223000

SECTION 224000

PLUMBING FIXTURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fixtures

1.2 RELATED REQUIREMENTS

A. Section 221005 - Plumbing Piping.

B. Section 221006 - Plumbing Piping Specialties.

1.3 REFERENCE STANDARDS

A. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration; 2008.

B. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2002).

C. ASME A112.18.1 - Plumbing Supply Fittings; 2012.

D. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2013.

E. ASME A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use); 2008 (R2013).

F. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2011.

1.4 SUBMITTALS

A. See Division 1 Section - Administrative Requirements, for submittal procedures.

B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

C. Manufacturer's Instructions: Indicate installation methods and procedures.

D. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Extra Faucet Washers: Two sets of each type and size.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.6 WARRANTY

A. Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.1 FIXTURES

A. Scheduled on drawings

B. Substitutions permitted, provided products are functionally and materially equivalent to those scheduled. Substitutions must be approvded by Engineer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.2 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall supports and bolts.

E. Seal fixtures to wall and floor surfaces with sealant, color to match fixture.

3.4 INTERFACE WITH WORK OF OTHER SECTIONS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.5 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.6 CLEANING

A. Clean plumbing fixtures and equipment.

3.7 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Do not permit use of fixtures by construction personnel.

C. Repair or replace damaged products before Date of Substantial Completion.

3.8 SCHEDULES

A. On Drawings

END OF SECTION 224000

SECTION 230001

MECHANICAL DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Mechanical demolition.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

4.1 EXAMINATION

A. Verify field measurements, pipe, ductwork, and equipment arrangements for new work as shown on Drawings.

B. Prior to submitting bid, visit site and become familiar with scope of demolition work required to accommodate new work.

C. Refer to Architectural Drawings for additional clarification of scope of demolition and new work.

D. Verify that abandoned equipment and associated mechanical installation serve only abandoned facilities.

E. Demolition drawings are based on casual field observation .

F. Should the contractor encounter any existing conditions related to the project area that prevent the work from being performed as indicated or described, contact the Architect immediately.

G. Report discrepancies to Architect before disturbing existing installation.

H. Beginning of demolition means installer accepts existing conditions.

4.2 PREPARATION

A. Remove ductwork, piping, controls, and all other mechanical installation from entire building.

B. Coordinate utility service outages with respective utility company.

C. Provide temporary connections as required to maintain existing systems in service during construction.

D. Restore services to items not being removed, but affected by the demolition work required for new construction.

4.3 DEMOLITION OF EXISTING MECHANICAL WORK

A. Remove existing installations in their entirety.

B. Remove abandoned equipment, controls, air devices, ductwork, piping, fixtures, and other mechanical installation. Piping and ductwork to be removed to source of supply.

C. Repair adjacent construction and finishes damaged during demolition and extension work.

D. Maintain access to existing mechanical installations that remain active. Modify installation or provide access panels as appropriate.

E. Extend existing installations using materials and methods compatible with existing installation or as specified.

4.4 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment that remain or that are to be reused.

END OF SECTION 230001

SECTION 230593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Measurement of final operating condition of HVAC systems.

1.2 REFERENCE STANDARDS

A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance Council; 2002.

B. NEBB (TAB) - Procedural Standards for Testing Adjusting Balancing of Environmental Systems; 2005, Seventh Edition.

1.3 SUBMITTALS

A. See Division 1 Section - Administrative Requirements, for submittal procedures.

B. Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.

C. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Submit to the Construction Manager within two weeks after completion of testing, adjusting, and balancing.
   2. Revise TAB plan to reflect actual procedures and submit as part of final report.
   3. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
   4. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
   5. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
   6. Units of Measure: Report data in I-P (inch-pound) units only.
   7. Include the following on the title page of each report:
      a. Name of Testing, Adjusting, and Balancing Agency.
      b. Address of Testing, Adjusting, and Balancing Agency.
      c. Telephone number of Testing, Adjusting, and Balancing Agency.
      d. Project name.
      e. Project location.
      f. Report date.

D. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
   1. AABC MN-1, AABC National Standards for Total System Balance.
   2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
   3. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

D. TAB Agency Qualifications:
   1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
   2. Having minimum of three years documented experience.
   3. Certified by one of the following:
      a. AABC, Associated Air Balance Council: www.aabchq.com; upon completion submit AABC National Performance Guaranty.
      b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.

E. TAB Supervisor Qualifications: Professional Engineer licensed in Oklahoma.

3.2 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
   5. Duct systems are clean of debris.
   6. Fans are rotating correctly.
   7. Fire and volume dampers are in place and open.
   8. Air coil fins are cleaned and combed.
   9. Access doors are closed and duct end caps are in place.
   10. Air outlets are installed and connected.
   11. Duct system leakage is minimized.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.3 PREPARATION

A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
   1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.

C. Provide additional balancing devices as required.

3.4 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 10 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 10 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.5 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:
   1. Running log of events and issues.
   2. Discrepancies, deficient or uncompleted work by others.
   3. Contract interpretation requests.
   4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.6 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities .

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. Where modulating dampers are provided, take measurements and balance at extreme conditions.

3.7 SCOPE

A. Test, adjust, and balance the following:
   1. Air Handling Units
   2. Fans
   3. Air Inlets and Outlets

3.8 MINIMUM DATA TO BE REPORTED

A. Electric Motors:
   1. Manufacturer
   2. Model/Frame
   3. HP/BHP
   4. Phase, voltage, amperage; nameplate, actual, no load
   5. RPM
   6. Service factor
   7. Starter size, rating, heater elements
   8. Sheave Make/Size/Bore

B. V-Belt Drives:
   1. Identification/location
   2. Required driven RPM
   3. Driven sheave, diameter and RPM
   4. Belt, size and quantity
   5. Motor sheave diameter and RPM
   6. Center to center distance, maximum, minimum, and actual

C. Air Cooled Condensers:
   1. Location
   2. Manufacturer
   3. Model number

D. Air Moving Equipment:
   1. Location
   2. Manufacturer
   3. Model number
   4. Air flow, specified and actual
   5. Total static pressure (total external), specified and actual

E. Exhaust Fans:
   1. Location
   2. Manufacturer
   3. Model number
   4. Air flow, specified and actual
   5. Total static pressure (total external), specified and actual

F. Air Distribution Tests:
   1. Room number/location
   2. Terminal type
   3. Design air flow
   4. Test (final) air flow
   5. Percent of design air flow

END OF SECTION 230593

SECTION 230713

DUCT INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Duct insulation.

B. Duct Liner.

1.2 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2014.

C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.

D. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2014.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

F. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

G. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.

H. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

I. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. See Division 1 Section - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of experienceand approved by manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.6 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, NFPA 255, or UL 723.

2.2 GLASS FIBER, FLEXIBLE

A. Manufacturer:
   1. Knauf Insulation: www.knaufusa.com.
   2. Johns Manville Corporation: www.jm.com/#sle.
   3. Owens Corning Corp: www.owenscorning.com/#sle.
   4. CertainTeed Corporation; : www.certainteed.com/#sle.

B. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. 'K' value: 0.25 at 75 degrees F, when tested in accordance with ASTM C518.
   2. Maximum Water Vapor Sorption: 5.0 percent by weight.

C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
   3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

2.3 DUCT LINER

A. Manufacturers:
   1. Armacell LLC; AP Coilflex: www.armacell.us/#sle.

B. Elastomeric Foam Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.
   1. Minimum Service Temperature: Minus 40 degrees F.
   2. Maximum Service Temperature: 180 degrees F.
   3. Fungal Resistance: No growth when tested according to ASTM G21.
   4. Apparent Thermal Conductivity: Maximum of 0.28 at 75 degrees F.
   5. Minimum Noise Reduction Coefficients:
      a. 1/2 inch Thickness: 0.30.
      b. 1 inch Thickness: 0.40.
   6. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation. Comply with ASTM C916.

D. Liner Fasteners: Galvanized steel, self-adhesive pad, impact applied, or welded with integral or press-on head.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that ducts have been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Insulated ducts:
   1. Provide insulation with vapor barrier jackets.
   2. Finish with tape and vapor barrier jacket.
   3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.

4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

C. External Duct Insulation Application:
   1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
   2. Secure insulation without vapor barrier with staples, tape, or wires.
   3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct 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.

D. Duct and Plenum Liner Application:
   1. Adhere insulation with adhesive for 90 percent coverage.
   2. Secure insulation with mechanical liner fasteners. Refer to SMACNA HVAC Duct Construction Standards for spacing.
   3. Seal and smooth joints. Seal and coat transverse joints.
   4. Seal liner surface penetrations with adhesive.
   5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

3.3 SCHEDULES

A. Ductwork located in basement: Flexible glass fiber duct insulation, 1-1/2" thick.

B. Outside Air Intake Ducts: Flexible glass fiber duct insulation, 1-1/2" thick.

C. Supply ducts from space heating and cooling equipment: Flexible glass fiber duct insulation, 1-1/2" thick.
   1. Omit duct wrap on exposed spiral ductwork.

D. Supply and return ducts within 5`of air handling equipment: Elastomeric Duct Liner, 1/2" thick.

END OF SECTION 230713

SECTION 230719

HVAC PIPING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.2 REFERENCE STANDARDS

A. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2014.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

C. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

D. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

E. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

PART 2 PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, NFPA 255, or UL 723.

2.2 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:
   1. Armacell LLC: www.armacell.us/#sle.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534 Grade 1; use molded tubular material wherever possible.
   1. Minimum Service Temperature: -40 degrees F.
   2. Maximum Service Temperature: 220 degrees F.
   3. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.3 JACKETS

A. PVC Plastic.
   1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F.
      b. Maximum Service Temperature: 150 degrees F.
      c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
      d. Thickness: 10 mil.
      e. Connections: Brush on welding adhesive.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Inserts and Shields:
   1. Application: Piping 1-1/2 inches diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert location: Between support shield and piping and under the finish jacket.
   4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

D. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to "Firestopping" Section.

E. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with canvas jacket sized for finish painting.

F. Exterior Applications: Provide PVC jacket.

3.3 SCHEDULE

A. Cooling Systems:
   1. Condensate Drains from Cooling Coils: 1/2" Flexible Elastomeric
   2. Refrigerant Suction: 1" Flexible Elastomeric
   3. Refrigerant Liquid/hot gas: Per system manufacturer's recommendations

END OF SECTION 230719

SECTION 232100

GENERAL REQUIREMENTS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Sleeves.
   2. Sleeve-seal systems.
   3. Grout.
   4. Escutcheons.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

E. Galvanized-Steel-Sheet Sleeves: 0.0239-inchminimum thickness; round tube closed with welded longitudinal joint.

F. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

G. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
   1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
   2. Pressure Plates: Stainless steel.
   3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.4 ESCUTCHEONS

A. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

B. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed or exposed-rivet hinge, and spring-clip fasteners.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
   1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
   1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
   2. 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.
   3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.
   1. Cut sleeves to length for mounting flush with both surfaces.
   2. Install sleeves that are large enough to provide 1/4-inchannular clear space between sleeve and pipe or pipe insulation.
   3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in other sections.

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in other sections.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 ESCUTCHEON INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
   1. Escutcheon Schedule:
      a. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with exposed-rivet hinge.
      b. Bare Piping in Equipment Rooms: One-piece, stamped-steel type or split-plate, stamped-steel type with exposed-rivet hinge.

END OF SECTION 232100

SECTION 232300

REFRIGERANT PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping.

B. Refrigerant.

1.2 RELATED REQUIREMENTS

A. Section 230719 - HVAC Piping Insulation.

1.3 REFERENCE STANDARDS

A. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2013.

B. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants; 2013.

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.

D. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2013.

E. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2013.

F. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011-AMD 1.

1.4 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties in shipping containers with labeling in place.

B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 PRODUCTS

2.1 PIPING

A. Copper Tube: ASTM B280, H58 hard drawn .
   1. Fittings: ASME B16.22 wrought copper.
   2. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy.

B. Pipe Supports and Anchors:
   1. Conform to ASME B31.5.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron adjustable swivel, split ring.
   3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   5. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
   7. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
   8. Inserts: Malleable iron case of 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.

2.2 REFRIGERANT

A. Refrigerant: R-410a as defined in ASHRAE Std 34.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Install refrigerant piping and accessories in accordance with split system manufacturer's recommendations.

B. Install refrigeration specialties in accordance with manufacturer's instructions.

C. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

D. Where piping must be exposed, obtain approval of routing from Architect prior to installation.

E. Install piping to conserve building space and avoid interference with use of space.

F. Group piping whenever practical at common elevations and locations. Slope piping per manufacturer's recommendations.

G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

H. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.5.
   2. Support horizontal piping as scheduled.
   3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
   4. Place hangers within 12 inches of each horizontal elbow.
   5. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
   6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
   7. Provide copper plated hangers and supports for copper piping.

I. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.

J. Provide clearance for installation of insulation and access to valves and fittings.

K. Provide access to concealed valves and fittings. Coordinate with General Contractor.

L. Flood piping system with nitrogen when brazing.

M. Where pipe support members are welded to structural building frame, brush clean, and apply one coat of zinc rich primer to welding.

N. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.

O. Fully charge completed system with refrigerant after testing.

P. Penetrations of roofs shall be made using manufactured roof penetration systems with curbs and pipe fittings. The use of "pitch pan" or similar installations is not acceptable.

3.3 FIELD QUALITY CONTROL

A. Test refrigeration system in accordance with ASME B31.5, and in accordance with VRFZ system manufacturer's recommendations.

3.4 SCHEDULES

A. Hanger Spacing for Copper Tubing.
   1. 1/2 inch, 5/8 inch, and 7/8 inch OD: Maximum span, 5 feet; minimum rod size, 1/4 inch.

2. 1-1/8 inch OD: Maximum span, 6 feet; minimum rod size, 1/4 inch.
3. 1-3/8 inch OD: Maximum span, 7 feet; minimum rod size, 3/8 inch.
4. 1-5/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.

END OF SECTION 232300

SECTION 233100

HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal ductwork.

B. Duct cleaning.

1.2 RELATED REQUIREMENTS

A. Section 230713 - Duct Insulation: External insulation and duct liner.

B. Section 233300 - Air Duct Accessories.

C. Section 230593 - Testing, Adjusting, and Balancing for HVAC.

1.3 REFERENCE STANDARDS

A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; 2013.

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

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

D. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

1.4 PERFORMANCE REQUIREMENTS

A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.5 SUBMITTALS

A. See Division 1 Section - Administrative Requirements, for submittal procedures.

B. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.6 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.1 DUCT ASSEMBLIES

2.2 MATERIALS

A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
2. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E84.

C. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

2.3 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards and as indicated.

B. No variation of duct configuration or size permitted except by written permission.

C. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

D. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.

E. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.

F. Provide air foil turning vanes when rectangular elbows must be used.

G. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

H. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA HVAC Duct Construction Standards.

I. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

J. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.4 MANUFACTURED DUCTWORK AND FITTINGS

A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages,reinforcing, and sealing for operating pressures indicated.

B. Flat Oval Ducts: Machine made from round spiral lockseam duct.
   1. Manufacture in accordance with SMACNA (DCS).
   2. Fittings: Manufacture at least two gages heavier metal than duct.
   3. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

C. Double Wall Insulated Flat Oval Ducts: Machine made from round spiral lockseam duct.
   1. Manufacture in accordance with SMACNA (DCS).
   2. Fittings: Manufacture with solid inner wall.
   3. Inner wall: Perforated galvanized steel.
   4. Insulation:
      a. Thickness: 1 inch fiberglass.

D. Transverse Duct Connection System: SMACNA "E" rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips.
   1. Manufacturers:

PART 3 EXECUTION

3.1 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA HVAC Duct Construction Standards.

B. Spiral ductwork in exposed locations shall be installed with aircraft cable and manufactured cam type hangers.

C. Install in accordance with manufacturer's instructions.

D. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

E. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

F. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

G. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot 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.

H. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

I. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.

J. Use double nuts and lock washers on threaded rod supports.

K. Connect flexible ducts to metal ducts with draw bands plus sheet metal screws and adhesive. Use a maximum of 5' of flexible duct, at final connection to diffusers only, free of kinks. Do not install above inaccessible ceilings. Do not use flexible ductwork in exposed areas.

L. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

M. At exterior wall louvers, seal duct to louver frame and install blank-out panels.

3.2 CLEANING

A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that could be harmed by excessive dirt with temporary filters, or bypass during cleaning.

3.3 SCHEDULES

A. Ductwork Material:
   1. Low Pressure Supply (Heating Systems): Steel.
   2. Low Pressure Supply (System with Cooling Coils): Steel.
   3. Return and Relief: Steel.
   4. General Exhaust: Steel.
   5. Outside Air Intake: Steel.

B. Ductwork Pressure Class:
   1. Supply (System with Cooling Coils): 1 inch.
   2. Return and Relief: 1 inch.
   3. General Exhaust: 1/2 inch.

C. Round ductwork shall be spiral where exposed. Concealed round ductwork may be spiral, double or single wall, or fabricated.
   1. Base bid: Exposed ductwork shall be single wall spiral.
   2. Alternate bid: Exposed ductwork shall be double wall spiral.

END OF SECTION 233100

SECTION 233300

AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Air turning devices/extractors.

B. Backdraft dampers.

C. Combination fire and smoke dampers.

D. Duct access doors.

E. Duct test holes.

F. Fire dampers.

G. Flexible duct connections.

H. Smoke dampers.

I. Volume control dampers.

1.2 RELATED REQUIREMENTS

A. Section 233100 - HVAC Ducts and Casings.

1.3 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

B. NFPA 92 - Standard for Smoke Control Systems; 2015.

C. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2014.

D. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

E. UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.

F. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.

G. UL 555S - Standard for Smoke Dampers; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Division 1 Section - Administrative Requirements, for submittal procedures.

B. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.

C. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers.

D. Manufacturer's Installation Instructions: Provide instructions for fire dampers.

E. Project Record Drawings: Record actual locations of access doors and test holes.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.1 AIR TURNING DEVICES/EXTRACTORS

A. Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.

2.2 BACKDRAFT DAMPERS

A. Gravity Backdraft Dampers, Size 24 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

2.3 COMBINATION FIRE AND SMOKE DAMPERS

A. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.

B. Provide factory sleeve and collar for each damper.

C. Multiple Blade Dampers: Fabricate with 16 gage galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 x 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch actuator shaft.

D. Operators: UL listed and labelled spring return electric type suitable for 120 volts, single phase, 60 Hz. Locate damper operator on exterior of duct and link to damper operating shaft.

2.4 DUCT ACCESS DOORS

A. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch thick insulation with sheet metal cover.
   1. Less Than 12 inches Square: Secure with sash locks.
   2. Up to 18 inches Square: Provide two hinges and two sash locks.
   3. Up to 24 x 48 inches: Three hinges and two compression latches with outside and inside handles.
   4. Larger Sizes: Provide an additional hinge.

2.5 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.6 FIRE DAMPERS

A. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.

B. Ceiling Dampers: Galvanized steel, 22 gage frame and 16 gage flap, two layers 0.125 inch ceramic fiber on top side and one layer on bottom side for round flaps, with locking clip.

C. Horizontal Dampers: Galvanized steel, 22 gage frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.

D. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream except for 1.0 inch pressure class ducts up to 12 inches in height.

E. Multiple Blade Dampers: 16 gage galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 x 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.

F. Fusible Links: UL 33, separate at 160 degrees F with adjustable link straps for combination fire/balancing dampers.

2.7 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.

B. Flexible Duct Connections: Fabric crimped into metal edging strip.
   1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
      a. Net Fabric Width: Approximately 2 inches wide.
   2. Metal: 3 inches wide, 24 gage thick galvanized steel.

C. Leaded Vinyl Sheet: Minimum 0.55 inch thick, 0.87 lbs per sq ft, 10 dB attenuation in 10 to 10,000 Hz range.

2.8 SMOKE DAMPERS

A. Fabricate in accordance with NFPA 90A and UL 555S, and as indicated.

B. Dampers: UL Class 1 multiple blade type fire damper, normally closed automatically operated by 120 VAC electric actuator.

2.9 VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.

B. Splitter Dampers:
   1. Material: Same gage as duct to 24 inches size in either direction, and two gages heavier for sizes over 24 inches.
   2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
   3. Operator: Minimum 1/4 inch diameter rod in self aligning, universal joint action, flanged bushing with set screw .

C. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.

D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

F. Quadrants:
   1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
   2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards. Refer to Section 233100 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Provide minimum 8 x 8 inch size for hand access, size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.

D. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.

E. Provide duct test holes where indicated and required for testing and balancing purposes.

F. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

G. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92.

H. Install smoke damper motors in locations to allow service/replacement without removal of permenant building components.

I. Demonstrate re-setting of fire dampers to Owner's representative.

J. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

K. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

L. 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. Omit dampers only where noted on drawings.

M. Where dampers or other accessories that require adjustment or maintenance are located above hard ceilings, provide access panel in ceiling. Coordinate with G.C.

END OF SECTION 233300

SECTION 233423

HVAC POWER VENTILATORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Roof exhausters.

B. Wall exhausters.

C. Cabinet exhaust fans.

1.2 REFERENCE STANDARDS

A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.

B. AMCA 99 - Standards Handbook; 2016.

C. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2005.

D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016.

E. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.

F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2014.

G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

H. UL 705 - Power Ventilators; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.

B. Manufacturer's Instructions: Indicate installation instructions.

C. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

PART 2 PRODUCTS

2.1 POWER VENTILATORS - GENERAL

A. Static and Dynamically Balanced: AMCA 204 - Balance Quality and Vibration Levels for Fans.

B. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.

C. Sound Ratings: AMCA 301, tested to AMCA 300 and bearing AMCA Certified Sound Rating Seal.

D. Fabrication: Conform to AMCA 99.

E. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.

F. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

G. Enclosed Safety Switches: Conform to NEMA 250.

2.2 ROOF EXHAUSTERS

A. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.

B. Roof Curb: 12 inch high self-flashing of galvanized steel with continuously welded seams, built-in cant strips.

C. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.

D. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.

E. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.3 WALL EXHAUSTERS

A. Fan Unit: V-belt or direct driven with spun aluminum housing; resiliently mounted motor; 1/2 inch mesh, 0.062 inch thick aluminum wire bird screen.

B. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.

C. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked.

D. Sheaves: For V-belt drives, provide cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.4 CABINET EXHAUST FANS

A. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing lined with acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge.

B. Grille: Molded white plastic.

C. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure roof exhausters with cadmium plated steel lag screws to roof curb.

C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.

D. Hung Cabinet Fans:

E. Provide sheaves required for final air balance.

F. Install backdraft dampers on inlet to roof and wall exhausters.

G. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans and as indicated.

END OF SECTION 233423

SECTION 233700

AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Diffusers.

B. Registers/grilles.

C. Louvers.

1.2 REFERENCE STANDARDS

A. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Inlets; 2006 (R2011).

1.3 SUBMITTALS

A. See Division 1 Section - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.4 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Hart & Cooley, Inc: www.hartandcooley.com.

B. Krueger: www.krueger-hvac.com/#sle.

C. Price Industries: www.price-hvac.com/#sle.

D. Titus: www.titus-hvac.com/#sle.

2.2 DIFFUSERS, REGISTERS, AND GRILLES

A. Type and performance are scheduled on the drawings.

B. Coordinate finish of all devices with Architect.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly. Omit dampers where drawings specifically indicate devices are to be provided without dampers.

E. Paint ductwork visible behind air outlets and inlets matte black. Coordinate with G.C.

END OF SECTION 233700

SECTION 234000

HVAC AIR CLEANING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Disposable, extended area panel filters.

B. Disposable panel filters.

1.2 REFERENCE STANDARDS

A. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2012, with 2015 amendments.

B. UL 900 - Standard for Air Filter Units; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. See Division 1 Section - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on filter media, filter performance data, filter assembly and filter frames, dimensions, motor locations and electrical characteristics and connection requirements.

C. Shop Drawings: Indicate filter assembly and filter frames, dimensions, motor locations, and electrical characteristics and connection requirements.

1.4 EXTRA MATERIALS

A. Provide one set of disposable panel filters. Filters shall be delivered to Owner.

PART 2 PRODUCTS

2.1 FILTER MANUFACTURERS

A. American Filtration Inc: www.americanfiltration.com/#sle.

B. AAF International/American Air Filter: www.aafintl.com/#sle.

C. Camfil Farr Company: www.camfilfarr.com/#sle.

2.2 DISPOSABLE, EXTENDED AREA PANEL FILTERS

A. Media: UL 900 Class 1, pleated, lofted, non-woven, reinforced cotton fabric; supported and bonded to welded wire grid by corrugated aluminum separators.
   1. Frame: Non-flammable.
   2. Nominal thickness: 2 inches.

B. Minimum Efficiency Reporting Value (MERV): 8, when tested in accordance with ASHRAE 52.2.

2.3 DISPOSABLE PANEL FILTERS

A. Media: UL 900 Class 2, fiber blanket, factory sprayed with flameproof, non-drip, non-volatile adhesive.
   1. Thickness: 1 inch.

B. Performance Rating:
   1. Face Velocity: 500 FPM.
   2. Initial Resistance: 0.15 inch WG.
   3. Recommended Final Resistance: 0.50 inches WG.

C. Casing: Cardboard frame.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install air cleaning devices in accordance with manufacturer's instructions.

B. Prevent passage of unfiltered air around filters with felt, rubber, or neoprene gaskets.

C. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with clean set.

D. Ensure that filters are easily removable from equipment, and that access is not blocked by other installations.

END OF SECTION 234000

SECTION 238119

SELF-CONTAINED AIR-CONDITIONERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Packaged terminal air conditioning units.

B. Wall sleeves.

C. Louvers.

D. Controls.

1.2 RELATED REQUIREMENTS

A. Section 262717 - Equipment Wiring: Installation of thermostats and other control components.

1.3 SUBMITTALS

A. Product Data: Provide drawings indicating dimensions, rough-in connections, and electrical characteristics and connection requirements.

B. Manufacturer's Instructions: Include assembly instructions, support details, connection requirements, and start-up instructions.

C. Operation and Maintenance Data: Provide maintenance data, parts lists, controls, and accessories. Include trouble-shooting guide.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. General Electric.

B. Approved substitution

2.2 AIR CONDITIONING UNITS

A. Description: Packaged, self-contained, through-the-wall air cooled terminal air conditioning units, with wall sleeve, room cabinet, electric refrigeration system, electric heating, remote temperature controls; fully charged with refrigerant and filled with oil.

B. Electrical Characteristics: On Drawings

2.3 CABINET

A. Cabinet: Sub-base mounted of 18 gage, 0.0478 inch galvanized steel with baked enamel finish, removable front panel with concealed latches, color selected by Owner.

B. Discharge Grille and Access Door: Removablepunched louver discharge grilles, allowing 4-way discharge air pattern with hinged door in top of cabinet for access to controls.

2.4 WALL SLEEVES AND LOUVERS

A. Wall Sleeves: 16 gage, 0.0598 inch galvanized steel with polyester finish.

B. Louvers: Flush anodized aluminum with enamel finish, color selected by Architect .

2.5 CHASSIS

A. Refrigeration System:
   1. Direct expansion cooling coil.
   2. Hermetically sealed compressor with internal spring isolation, external isolation, permanent split capacitor motor and overload protection.
   3. Accumulator.
   4. Condenser coil and fan.

B. Air System: Centrifugal forward curved tangential evaporator fans with two speed permanent split capacitor motor, permanent washable filters, positive pressure ventilation damper with concealed manual operator.

C. Heating Coil: Electric.

D. Condenser Fan: Centrifugal, forward curved type with separate permanent split capacitor motor.

2.6 CONTROLS

A. Control Module: Remote mounted programmable thermostat with heat anticipator, heat-off-cool switch, high-low fan switch.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Coordinate installation of units with architectural, mechanical, and electrical work.

END OF SECTION 238119

SECTION 238128

SMALL SPLIT-SYSTEM HEATING AND COOLING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Forced air furnaces.

B. Air cooled condensing units.

C. Controls.

1.2 RELATED REQUIREMENTS

A. Section 233100 - HVAC Ducts and Casings.

B. Section 262717 - Equipment Wiring: Electrical characteristics and wiring connections and installation and wiring of thermostats and other controls components.

1.3 REFERENCE STANDARDS

A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008.

B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.

C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2013.

D. ASHRAE Std 23.1 - Methods of Testing for Rating Positive Displacement Refrigerant Compressors and Condensing Units; 2010.

E. NEMA MG 1 - Motors and Generators; 2014.

F. NFPA 54 - National Fuel Gas Code; 2015.

G. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

H. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2015.

I. NFPA 211 - Guide for Smoke and Heat Venting; 2013, Including All Amendments.

J. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

B. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

C. Design Data: Indicate refrigerant pipe sizing.

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.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements, for additional provisions.
2. Extra Filters: One for each unit.

1.5 WARRANTY

A. Provide five year manufacturers warranty for heat exchangers.

B. Provide five year manufacturers warranty for compressors.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Carrier Corporation: www.carrier.com.

B. Trane Inc: www.trane.com.

C. Lennox: www.lennox.com

D. Approved substitute.

2.2 SYSTEM DESIGN

A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
   1. Heating: Natural gas fired.
   2. Cooling: Outdoor electric condensing unit with evaporator coil in central ducted indoor unit.
   3. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.
      a. Pipe sizes for each unit shall be sized per the manufacturer's recommendations and account for line length and suction lift requirements. Provide manufacturer's confirmation for each unit that proposed installation and line sizes will provide proper system operation.

B. Performance Requirements: See Drawings for additional requirements.

2.3 INDOOR UNITS FOR DUCTED SYSTEMS

A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating and cooling element(s), controls, and accessories; wired for single power connection with control transformer.
   1. Air Flow Configuration: As indicated on drawings.
   2. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.

B. Supply Fan: Centrifugal type rubber mounted with direct or belt drive with adjustable variable pitch motor pulley.
   1. Motor: NEMA MG 1; 1750 rpm single speed, permanently lubricated, hinge mounted.
   2. Motor Electrical Characteristics:

C. Air Filters: 1 inch thick urethane, washable type arranged for easy replacement.

D. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
   1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
   2. Manufacturers: System manufacturer.

2.4 OUTDOOR UNITS

A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
   1. Refrigerant: R-410A.
   2. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23 and UL listed.

B. Compressor: Scroll, 3600 rpm, AHRI 520 resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling.

C. Air Cooled Condenser: ARI 520; Aluminum fin and copper tube coil, with direct drive axial propeller fan resiliently mounted, galvanized fan guard.

D. Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gage ports, thermometer well (in liquid line).
   1. Provide thermostatic expansion valves.

E. Operating Controls:
   1. Control by programmable room thermostat to maintain room temperature setting.

2.5 GAS FURNACE COMPONENTS

A. Burner: High efficiency condensing with piped combustion air and flue.
   1. Gas valve, two stage provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.
   2. Non-corrosive combustion air blower with permanently lubricated motor.

B. Burner Safety Controls:
   1. Thermocouple Sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.
   2. Flame Rollout Switch: Installed on burner box and prevents operation.
   3. Vent Safety Shutoff Sensor: Temperature sensor installed on draft hood and prevents operation, manual reset.
   4. Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature, automatic resets.

C. Operating Controls:
   1. Cycle burner by room thermostat to maintain room temperature setting.
   2. Supply fan energized from bonnet temperature independent of burner controls, with adjustable timed off delay and fixed timed on delay, with manual switch for continuous fan operation.

D. Flue Termination: Concentric roof/wall kit.

2.6 ACCESSORY EQUIPMENT

A. Room Thermostat: Wall-mounted, electric solid state microcomputer based room thermostat with sensor to maintain temperature setting; low-voltage; with following features:
   1. Automatic switching from heating to cooling.
   2. Preferential rate control to minimize overshoot and deviation from setpoint.
   3. Set-up for four separate temperatures per day.
   4. Programming based on weekdays, Saturday and Sunday.
   5. Thermostat display:
      a. Actual room temperature.
      b. Programmed temperature.
      c. System mode indication: heating, cooling, fan auto, off, and on, auto or on, off.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with NFPA 90A and NFPA 90B.

B. Install gas fired furnaces in accordance with NFPA 54.

C. Provide combustion air and vent connections in accordance with manufacturer's recommendations.

D. Install refrigeration systems in accordance with ASHRAE Std 15.

END OF SECTION 238128

SECTION 260501

ELECTRICAL DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical demolition.

PART 3 EXECUTION

2.1 EXAMINATION

A. Verify field measurements and circuiting arrangements are as indicated.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Demolition drawings are based on casual field observation.

D. Report discrepancies to Architect before disturbing existing installation.

E. Beginning of demolition means installer accepts existing conditions.

2.2 PREPARATION

A. Disconnect and remove electrical systems where required.

B. Coordinate utility service outages with utility company.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
   1. Obtain permission from Owner at least 24 hours before partially or completely disabling system.

E. Existing Telephone System: Maintain existing system in service. Disable system only to make switchovers and connections. Minimize outage duration.
   1. Notify Owner at least 24 hours before partially or completely disabling system.

2.3 DEMOLITION OF ELECTRICAL WORK

A. Remove existing installations as indicated and as required for new work.

B. Remove abandoned equipment, conduit, and wiring.

C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed.

E. Disconnect and remove abandoned panelboards and distribution equipment.

F. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

G. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

H. Repair adjacent construction and finishes damaged during demolition.

I. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

J. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

END OF SECTION 260501

SECTION 260519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Single conductor building wire.

B. Metal-clad cable.

C. Power and control tray cable.

D. Wiring connectors.

E. Electrical tape.

F. Oxide inhibiting compound.

G. Wire pulling lubricant.

H. Cable ties.

1.2 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

C. Section 283100 - Fire Detection and Alarm: Fire alarm system conductors and cables.

1.3 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013.

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011.

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010 (Reapproved 2014).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2014).

E. ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers; 2005 (Reapproved 2011).

F. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy Wire for Subsequent Covering of Insulation; 2007 (Reapproved 2012).

G. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2010.

H. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

I. NECA 104 - Recommended Practice for Installing Aluminum Building Wire and Cable; 2012.

J. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.

K. NEMA WC 70 - Nonshielded Power Cable 2000 V or Less for the Distribution of Electrical Energy; 2009.

L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

N. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

O. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

P. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

Q. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

R. UL 1277 - Electrical Power and Control Tray Cables with Optional Optical-Fiber Members; Current Edition, Including All Revisions.

S. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
   3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

C. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors. Include proposed modifications to raceways, boxes, wiring gutters, enclosures, etc. to accommodate substituted conductors.

D. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.8 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.1 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Nonmetallic-sheathed cable is not permitted.

D. Underground feeder and branch-circuit cable is not permitted.

E. Service entrance cable is not permitted.

F. Metal-clad cable is permitted only as follows:
   1. Where not otherwise restricted, may be used:
      a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
         1) Maximum Length: 6 feet.
      b. Where concealed in hollow stud walls, under raised floors, and above ceilings for branch circuits up to 20 A.
   2. In addition to other applicable restrictions, may not be used:

a. Unless approved by Owner.
b. Where not approved for use by the authority having jurisdiction.
c. Where exposed to view.
d. Where exposed to damage.
e. For damp, wet, or corrosive locations.

2.2 CONDUCTOR AND CABLE MANUFACTURERS

A. AFC Cable Systems: www.afcweb.com

B. Alan Wire Company: www.alanwire.com.

C. Cerro Wire LLC: www.cerrowire.com.

D. Encore Wire Corporation: www.encorewire.com.

E. Southwire Company: www.southwire.com.

F. Substitutions: See Section 016000 - Product Requirements.

2.3 ALL CONDUCTORS AND CABLES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed and classified by testing firm acceptable to the authority having jurisdiction as suitable for the purpose indicated.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductor Material:
1. Provide copper conductors except where aluminum conductors are specifically indicated. Substitution of aluminum conductors for copper is not permitted. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.
2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B 787M unless otherwise indicated.
3. Tinned Copper Conductors: Comply with ASTM B33.
4. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded in accordance with ASTM B801 unless otherwise indicated.

H. Minimum Conductor Size:
1. Branch Circuits: 12 AWG.
a. Exceptions:
1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.
2. Control Circuits: 14 AWG.

I. Conductor Color Coding:
1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
2. Color Coding Method: Integrally colored insulation.
a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
3. Color Code:
a. 208Y/120 V, 3 Phase, 4 Wire System:
1) Phase A: Black.

2) Phase B: Red.
3) Phase C: Blue.
4) Neutral/Grounded: White.

b. Equipment Ground, All Systems: Green.
c. Travelers for 3-Way and 4-Way Switching: Pink.
d. For control circuits, comply with manufacturer's recommended color code.

2.4 SINGLE CONDUCTOR BUILDING WIRE

A. Description: Single conductor insulated wire.

B. Conductor Stranding:
1. Feeders and Branch Circuits:
a. Size 10 AWG and Smaller: Solid.
b. Size 8 AWG and Larger: Stranded.
2. Control Circuits: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation:
1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2.
2. Aluminum Building Wire (only where specifically indicated or permitted for substitution): Type XHHW-2.

2.5 METAL-CLAD CABLE

A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

B. Conductor Stranding:
1. Size 10 AWG and Smaller: Solid.
2. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

E. Grounding: Full-size integral equipment grounding conductor.

F. Armor: Aluminum or steel, interlocked tape.

G. Provide PVC jacket applied over cable armor where indicated or required for environment of installed location.

2.6 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Wiring Connectors for Splices and Taps:
1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

C. Wiring Connectors for Terminations:
1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
4. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.

5. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
6. Conductors for Control Circuits: Use crimped terminals for all connections.

D. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

E. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

F. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

G. Mechanical Connectors: Provide bolted type or set-screw type.

H. Compression Connectors: Provide circumferential type or hex type crimp configuration.

I. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

2.7 WIRING ACCESSORIES

A. Electrical Tape:
1. Manufacturers:
a. 3M: www.3m.com/#sle.
b. Plymouth Rubber Europa: www.plymouthrubber.com/#sle.
2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.

B. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.

C. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.

D. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as shown on the drawings.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.3 INSTALLATION

A. Circuiting Requirements:
1. Unless dimensioned, circuit routing indicated is diagrammatic.
2. When circuit destination is indicated and routing is not shown, determine exact routing required.
3. Arrange circuiting to minimize splices.
4. Include circuit lengths required to install connected devices within 10 ft of location shown.
5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.

6. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are shown as separate, combining them together in a single raceway is permitted, under the following conditions:
    a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
7. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Install conductors and cable in a neat and workmanlike manner in accordance with NECA 1.

D. Install metal-clad cable (Type MC) in accordance with NECA 120.

E. Installation in Raceway:
1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
2. Pull all conductors and cables together into raceway at same time.
3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.

H. Terminate cables using suitable fittings.
1. Metal-Clad Cable (Type MC):
    a. Use listed fittings.
    b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
    c. Do not use direct-bearing set-screw type fittings for cables with aluminum armor.

I. Install conductors with a minimum of 12 inches of slack at each outlet.

J. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

K. Make wiring connections using specified wiring connectors.
1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
3. Do not remove conductor strands to facilitate insertion into connector.
4. Clean contact surfaces on conductors and connectors to suitably remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

L. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
    a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.

a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.

3. Wet Locations: Use heat shrink tubing.

M. Insulate ends of spare conductors using vinyl insulating electrical tape.

N. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

O. Identify conductors and cables in accordance with Section 260553.

P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

Q. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.4 FIELD QUALITY CONTROL

A. Perform inspection, testing, and adjusting in accordance with Section 014000.

B. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION 260519

SECTION 260526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

E. Ground rod electrodes.

F. Grounding and bonding components.

G. Provide all components necessary to complete the grounding system(s) consisting of:
   1. Metal underground water pipe.
   2. Metal underground gas piping system.
   3. Rod electrodes.

1.2 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2007.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify exact locations of underground metal water service pipe entrances to building.
   2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
   3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.4 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 25 ohms.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

C. Test Reports: Indicate overall resistance to ground .

D. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications for Signal Reference Grids: Company with minimum five years documented experience with high frequency grounding systems.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. Grounding System Resistance:
   1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
   2. Grounding Electrode System: Not greater than 25 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.

E. Grounding Electrode System:
   1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
      a. Provide continuous grounding electrode conductors without splice or joint.
      b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
   2. Metal Underground Water Pipe(s):
      a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
      b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
      c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
   3. Metal Building or Structure Frame:
      a. Provide connection to metal building or structure frame effectively grounded in accordance with NFPA 70 at nearest accessible location.
   4. Concrete-Encased Electrode:
      a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
   5. Ground Rod Electrode(s):
      a. Provide single electrode unless otherwise indicated or required.
      b. Space electrodes not less than 10 feet from each other and any other ground electrode.
      c. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
   6. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.

7. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.

F. Service-Supplied System Grounding:
   1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
   2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

G. Bonding and Equipment Grounding:
   1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
   2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
   3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
   4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
   5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
   6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
   7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
      a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
      b. Metal gas piping.

H. Communications Systems Grounding and Bonding:
   1. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
      a. Bonding Jumper Size: As indicated.
      b. Raceway Size: 3/4 inch unless otherwise indicated or required.
      c. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
      d. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

I. Pole-Mounted Luminaires: Also comply with Section 265600.

2.2 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
   1. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.
   2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in addition to requirements of Section 260519:
   1. Use insulated copper conductors unless otherwise indicated.
      a. Exceptions:
         1) Use bare copper conductors where installed underground in direct contact with earth.
         2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:
   1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.

2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
    a. Exceptions:
        1) Use exothermic welded connections for connections to metal building frame.
4. Manufacturers - Mechanical and Compression Connectors:
    a. Burndy: www.burndy.com.
    b. Thomas & Betts Corporation: www.tnb.com/#sle.
5. Manufacturers - Exothermic Welded Connections:
    a. Burndy: www.burndy.com.
    b. Cadweld, a brand of Erico International Corporation: www.erico.com/#sle.
    c. ThermOweld, a brand of Continental Industries, Inc: www.thermoweld.com/#sle.

D. Ground Bars:
1. Description: Copper rectangular ground bars with mounting brackets and insulators.
2. Size: As indicated.
3. Holes for Connections: As indicated or as required for connections to be made.

E. Ground Rod Electrodes:
1. Comply with NEMA GR 1.
2. Material: Copper-bonded (copper-clad) steel.
3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as shown on the drawings.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Verify existing conditions prior to beginning work.

E. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install grounding and bonding system components in a neat and workmanlike manner in accordance with NECA 1.

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.

D. Make grounding and bonding connections using specified connectors.
1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components in accordance with Section 260553.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

C. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION 260526

SECTION 260529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Support and attachment components for equipment, conduit, cable, boxes, and other electrical work.

1.2 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

B. MFMA-4 - Metal Framing Standards Publication; 2004.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer’s catalog data for fastening systems.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with applicable building code.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
   2. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated, where applicable.
   3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
   4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
      a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
   1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
   2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.

D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
   1. Comply with MFMA-4.

E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.

F. Anchors and Fasteners:

1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
4. Hollow Masonry: Use toggle bolts.
5. Hollow Stud Walls: Use toggle bolts.
6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
7. Sheet Metal: Use sheet metal screws.
8. Wood: Use wood screws.
9. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    a. Comply with MFMA-4.
    b. Channel Material: Use galvanized steel.
    c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install support and attachment components in a neat and workmanlike manner in accordance with NECA 1.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Equipment Support and Attachment:
1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

I. Secure fasteners according to manufacturer's recommended torque settings.

J. Remove temporary supports.

3.2 FIELD QUALITY CONTROL

A. Inspect support and attachment components for damage and defects.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION 260529

SECTION 260533.23

SURFACE RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface raceway systems.

1.2 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260534 - Conduit.

D. Section 260537 - Boxes.

E. Section 262726 - Wiring Devices: Receptacles.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 5 - Surface Metal Raceways and Fittings; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of raceways with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate rough-in locations of outlet boxes provided under Section 260537 and conduit provided under Section 260534 as required for installation of raceways provided under this section.
   3. Verify minimum sizes of raceways with the actual conductors and components to be installed.
   4. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install raceways until final surface finishes and painting are complete.
   2. Do not begin installation of conductors and cables until installation of raceways is complete between outlet, junction and splicing points.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including dimensions, knockout sizes and locations, materials, fabrication details, finishes, service condition requirements, and accessories.
   1. Surface Raceway Systems: Include information on fill capacities for conductors and cables.

PART 2 PRODUCTS

2.1 RACEWAY REQUIREMENTS

A. Provide all components, fittings, supports, and accessories required for a complete raceway system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Do not use raceways for applications other than as permitted by NFPA 70 and product listing.

2.2 SURFACE RACEWAY SYSTEMS

A. Manufacturers:
   1. Wiremold, a brand of Legrand North America, Inc: www.legrand.us/#sle.

B. Surface Metal Raceways: Listed and labeled as complying with UL 5.

C. Surface Raceway System:

1. Raceway Type: Single channel, painted steel.
2. Color: To be selected by Architect.
3. Accessory Device Boxes: Suitable for the devices to be installed; color to match raceway.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install raceways plumb and level.

D. Arrange wireways and associated raceway connections to comply with NFPA 70, including but not limited to requirements for deflected conductors and wireways used as pullboxes. Increase size of wireway where necessary.

E. Secure and support raceways in accordance with Section 260529 at intervals complying with NFPA 70 and manufacturer's requirements.

F. Close unused raceway openings.

G. Provide grounding and bonding in accordance with Section 260526.

END OF SECTION 260533.23

SECTION 260534

CONDUIT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Intermediate metal conduit (IMC).

C. Flexible metal conduit (FMC).

D. Liquidtight flexible metal conduit (LFMC).

E. Electrical metallic tubing (EMT).

F. Rigid polyvinyl chloride (PVC) conduit.

G. Conduit fittings.

H. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260529 - Hangers and Supports for Electrical Systems.

D. Section 260537 - Boxes.

E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

F. Section 271005 - Structured Cabling for Voice and Data - Inside-Plant: Additional requirements for communications systems conduits.

1.3 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.

B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.

C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2005.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.

F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.

G. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.

H. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2015.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

K. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

L. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.

M. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

N. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

O. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

P. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.5 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

B. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2 inch (53 mm) trade size and larger.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:
1. Under Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or rigid PVC conduit.
2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), or rigid PVC conduit.
3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or rigid PVC conduit.
4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
5. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.
6. Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape to provide supplementary corrosion protection.
7. Where steel conduit emerges from concrete into soil, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches on either side of where conduit emerges.

D. Embedded Within Concrete:
1. Within Slab on Grade: Not permitted.
2. Within Slab Above Ground: Not permitted.

3. Within Concrete Walls Above Ground: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or rigid PVC conduit.
4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from concrete.

E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
1. Locations subject to physical damage include, but are not limited to:
a. Where exposed below 8 feet, except within electrical and communication rooms or closets.
b. Where exposed below 20 feet in warehouse areas.

K. Exposed, Exterior: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

L. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

M. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
1. Maximum Length: 6 feet.

N. Connections to Vibrating Equipment:
1. Dry Locations: Use flexible metal conduit.
2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
3. Maximum Length: 6 feet unless otherwise indicated.
4. Vibrating equipment includes, but is not limited to:
a. Transformers.
b. Motors.

2.2 CONDUIT REQUIREMENTS

A. Electrical Service Conduits: Also comply with Section 262701.

B. Communications Systems Conduits: Also comply with Section 271005.

C. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.

D. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.

E. Minimum Conduit Size, Unless Otherwise Indicated:
1. Branch Circuits: 1/2 inch (16 mm) trade size.
2. Control Circuits: 1/2 inch (16 mm) trade size.
3. Flexible Connections to Luminaires: 1/2 inch (16 mm) trade size.
4. Underground, Interior: 3/4 inch (21 mm) trade size.
5. Underground, Exterior: 1 inch (27 mm) trade size.

F. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:
1. Allied Tube & Conduit: www.alliedeg.com/#sle.

2. Republic Conduit: www.republic-conduit.com/#sle.
3. Wheatland Tube Company: www.wheatland.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

C. Fittings:
1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
a. Do not use die cast zinc fittings.
3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.4 INTERMEDIATE METAL CONDUIT (IMC)

A. Manufacturers:
1. Allied Tube & Conduit: www.alliedeg.com/#sle.
2. Republic Conduit: www.republic-conduit.com/#sle.
3. Wheatland Tube Company: www.wheatland.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

C. Fittings:
1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
a. Do not use die cast zinc fittings.
3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.5 FLEXIBLE METAL CONDUIT (FMC)

A. Manufacturers:
1. AFC Cable Systems, Inc: www.afcweb.com/#sle.
2. Electri-Flex Company: www.electriflex.com/#sle.
3. International Metal Hose: www.metalhose.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

B. Description: NFPA 70, Type FMC standard wall steel or standard wall aluminum flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.

C. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
a. Do not use die cast zinc fittings.

2.6 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Manufacturers:
1. AFC Cable Systems, Inc: www.afcweb.com/#sle.
2. Electri-Flex Company: www.electriflex.com/#sle.
3. International Metal Hose: www.metalhose.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel or aluminum flexible metal conduit listed and labeled as complying with UL 360.

C. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
    a. Do not use die cast zinc fittings.

2.7 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:
1. Allied Tube & Conduit: www.alliedeg.com/#sle.
2. Republic Conduit: www.republic-conduit.com/#sle.
3. Wheatland Tube Company: www.wheatland.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
    a. Do not use die cast zinc fittings.
3. Connectors and Couplings: Use compression (gland) or set-screw type.
    a. Do not use indenter type connectors and couplings.

2.8 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Manufacturers:
1. Cantex Inc: www.cantexinc.com/#sle.
2. Carlon, a brand of Thomas & Betts Corporation: www.carlon.com/#sle.
3. JM Eagle: www.jmeagle.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C. Fittings:
1. Manufacturer: Same as manufacturer of conduit to be connected.
2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.9 ACCESSORIES

A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil.

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.

C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force.

E. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on drawings.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in a neat and workmanlike manner in accordance with NECA 1.

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install intermediate metal conduit (IMC) in accordance with NECA 101.

E. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

F. Conduit Routing:
   1. Unless dimensioned, conduit routing indicated is diagrammatic.
   2. When conduit destination is indicated and routing is not shown, determine exact routing required.
   3. Conceal all conduits unless specifically indicated to be exposed.
   4. Conduits in the following areas may be exposed, unless otherwise indicated:
      a. Electrical rooms.
      b. Mechanical equipment rooms.
      c. Within joists in areas with no ceiling.
   5. Unless otherwise approved, do not route conduits exposed:
      a. Across floors.
      b. Across roofs.
      c. Across top of parapet walls.
      d. Across building exterior surfaces.
   6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
   7. Arrange conduit to maintain adequate headroom, clearances, and access.
   8. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
   9. Route conduits above water and drain piping where possible.
   10. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
   11. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
   12. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
      a. Heaters.
      b. Hot water piping.
      c. Flues.
   13. Group parallel conduits in the same area together on a common rack.

G. Conduit Support:
   1. Secure and support conduits in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
   3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
   4. Use conduit strap to support single surface-mounted conduit.
      a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
   5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
   6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
   7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.

H. Connections and Terminations:
   1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.

2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
8. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

I. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

J. Underground Installation:
1. Provide trenching and backfilling in accordance with specifications.
2. Minimum Cover, Unless Otherwise Indicated or Required:
   a. Underground, Exterior: 24 inches.
   b. Under Slab on Grade: 12 inches to bottom of slab.
3. Provide underground warning tape in accordance with Section 260553 along entire conduit length for service entrance where not concrete-encased.

K. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 033000 with minimum concrete cover of 3 inches on all sides unless otherwise indicated.

L. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where conduits are subject to earth movement by settlement or frost.

M. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

N. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

O. Provide grounding and bonding in accordance with Section 260526.

P. Identify conduits in accordance with Section 260553.

Q. Conduit in exposed areas will be painted. Coordinate with G.C. Entire conduit system, including boxes and coverplates shall be installed prior to painting.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective conduits.

3.4 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.5 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION 260534

SECTION 260537

BOXES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

C. Pull and junction boxes.

1.2 RELATED REQUIREMENTS

A. Section 083100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.

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 262726 - Wiring Devices:
   1. Wall plates.

F. Section 262716 - Electrical Cabinets and Enclosures.

G. Section 262726 - Wiring Devices: Wall plates in finished areas.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.

D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

I. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

J. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

K. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. 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 for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
   4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.

5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Project Record Documents: Record actual locations and mounting heights of outlet, pull, and junction boxes on project record documents.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.1 BOXES

A. General Requirements:
1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
3. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.
4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
3. Use suitable concrete type boxes where flush-mounted in concrete.
4. Use suitable masonry type boxes where flush-mounted in masonry walls.
5. Use raised covers suitable for the type of wall construction and device configuration where required.
6. Use shallow boxes where required by the type of wall construction.
7. Do not use "through-wall" boxes designed for access from both sides of wall.
8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
10. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C. Use of nometallic boxes shall be limited to new framed walls.
11. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
12. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes.
13. Wall Plates: Comply with Section 262726.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA 250 Environment Type, Unless Otherwise Indicated:
3. Junction and Pull Boxes Larger Than 100 cubic inches:

a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

4. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on drawings.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Verify locations of outlets in offices and work areas prior to rough-in.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

E. Box Locations:

1. Locate boxes to be accessible. Provide access panels in accordance with Section 083100 as required where approved by the Architect.
2. Unless dimensioned, box locations indicated are approximate.
3. Locate boxes as required for devices installed under other sections or by others.
4. Locate boxes so that wall plates do not span different building finishes.
5. Locate boxes so that wall plates do not cross masonry joints.

F. Box Supports:

1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

G. Install boxes plumb and level.

H. Flush-Mounted Boxes:

1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

I. Install boxes as required to preserve insulation integrity.

J. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

K. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

L. Close unused box openings.

M. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

N. Provide grounding and bonding in accordance with Section 260526.

O. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1.

P. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 70.

Q. Coordinate installation of outlet boxes for equipment connected under Section 262717.

R. Set wall mounted boxes at elevations to accommodate mounting heights indicated.

S. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.
   1. Adjust box locations up to 10 feet if required to accommodate intended purpose.

T. Orient boxes to accommodate wiring devices oriented as specified in Section 262726.

U. Maintain headroom and present neat mechanical appearance.

V. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

W. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

X. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

Y. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.

Z. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

AA. Use flush mounting outlet box in finished areas.

AB. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

AC. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

AD. Locate outlet boxes so that wall plates do not span different building finishes.

AE. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation.

AF. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

AG. Use stamped steel bridges to fasten flush mounting outlet box between studs.

AH. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

AI. Use adjustable steel channel fasteners for hung ceiling outlet box.

AJ. Do not fasten boxes to ceiling support wires.

AK. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.

AL. Use gang box where more than one device is mounted together. Do not use sectional box.

AM. Use gang box with plaster ring for single device outlets.

AN. Use cast outlet box in exterior locations exposed to the weather and wet locations.

AO. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.

AP. Identify boxes in accordance with Section 260553.

3.3 ADJUSTING

A. Adjust flush-mounting outlets to make front flush with finished wall material.

B. Install knockout closures in unused box openings.

3.4 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

END OF SECTION 260537

SECTION 260553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Underground warning tape.

E. Warning signs and labels.

1.2 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

B. Section 262726 - Wiring Devices: Device and wallplate finishes; factory pre-marked wallplates.

1.3 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:
   1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
   2. Do not install identification products until final surface finishes and painting are complete.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.6 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:
   1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
      a. Switchboards:
         1) Identify voltage and phase.
         2) Use identification nameplate to identify main overcurrent protective device.
         3) Use identification nameplate to identify load(s) served for each branch device.
      b. Panelboards:
         1) Identify ampere rating.
         2) Identify voltage and phase.
         3) Use typewritten circuit directory to identify load(s) served for panelboards with a door.
         4) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
      c. Enclosed switches:
         1) Identify voltage and phase.

2) Identify load(s) served. Include location when not within sight of equipment.

d. Enclosed Contactors:

1) Identify coil voltage.

2) Identify load(s) and associated circuits controlled. Include location.

2. Service Equipment:

a. Use identification nameplate to identify each service disconnecting means.

3. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.

4. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.

5. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for switchboards and panelboards.

a. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.

B. Identification for Conductors and Cables:

1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.

2. Identification for Communications Conductors and Cables: Comply with Section 271005.

3. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment.

C. Identification for Raceways:

1. Use identification labels or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.

2. Use underground warning tape to identify underground raceways.

D. Identification for Boxes:

1. Use color coded boxes to identify systems other than normal power system.

a. Color-Coded Boxes: Field-painted in accordance with Section 099000 per the following color code:.

1) Fire Alarm System: Red.

E. Identification for Devices:

1. Identification for Communications Devices: Comply with Section 271005.

2. Wiring Device and Wallplate Finishes: Comply with Section 262726.

3. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.

4. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.

2.2 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Materials:

a. Indoor Clean, Dry Locations: Use plastic nameplates.

b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.

2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.

a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.

3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.

4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.

5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:
   1. Manufacturers:
   2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
      a. Use only for indoor locations.
   3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:
   1. Minimum Size: 1 inch by 2.5 inches.
   2. Legend:
      a. Equipment designation or other approved description.
      b. Other information as indicated.
   3. Text: All capitalized unless otherwise indicated.
   4. Minimum Text Height:
      a. Equipment Designation: 1/2 inch.
      b. Other Information: 1/4 inch.
   5. Color:
      a. Normal Power System: White text on black background.
      b. Fire Alarm System: White text on red background.

D. Format for General Information and Operating Instructions:
   1. Minimum Size: 1 inch by 2.5 inches.
   2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
   3. Text: All capitalized unless otherwise indicated.
   4. Minimum Text Height: 1/4 inch.
   5. Color: Black text on white background unless otherwise indicated.
      a. Exceptions:
         1) Provide white text on red background for general information or operational instructions for fire alarm systems.

E. Format for Caution and Warning Messages:
   1. Minimum Size: 2 inches by 4 inches.
   2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
   3. Text: All capitalized unless otherwise indicated.
   4. Minimum Text Height: 1/2 inch.
   5. Color: Black text on yellow background unless otherwise indicated.

F. Format for Control Device Identification:
   1. Minimum Size: 3/8 inch by 1.5 inches.
   2. Legend: Load controlled or other designation indicated.
   3. Text: All capitalized unless otherwise indicated.
   4. Minimum Text Height: 3/16 inch.
   5. Color: Black text on clear background.

2.3 WIRE AND CABLE MARKERS

A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

C. Legend: Power source and circuit number or other designation indicated.

D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
   1. Do not use handwritten text.

E. Minimum Text Height: 1/8 inch.

F. Color: Black text on white background unless otherwise indicated.

2.4 UNDERGROUND WARNING TAPE

A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
   1. Exception: Use foil-backed detectable type tape where required by serving utility.

B. Non-detectable Type Tape: 3 inches wide, with minimum thickness of 4 mil.

C. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.

D. Legend: Type of service, continuously repeated over full length of tape.

E. Color:
   1. Tape for Buried Power Lines: Black text on red background.
   2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.5 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:
   1. Materials:
      a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
      b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
   2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
   3. Minimum Size: 7 by 10 inches unless otherwise indicated.

C. Warning Labels:
   1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
   2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
   3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
   1. Surface-Mounted Equipment: Enclosure front.
   2. Flush-Mounted Equipment: Enclosure front.
   3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
   4. Elevated Equipment: Legible from the floor or working platform.
   5. Branch Devices: Adjacent to device.
   6. Interior Components: Legible from the point of access.
   7. Conduits: Legible from the floor.
   8. Boxes: Outside face of cover.
   9. Conductors and Cables: Legible from the point of access.
   10. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
   1. Do not use adhesives on exterior surfaces except where substrate can not be penetrated.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 12 inch(es) below finished grade.

G. Secure rigid signs using stainless steel screws.

H. Mark all handwritten text, where permitted, to be neat and legible.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION 260553

SECTION 260923

LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Occupancy sensors.

B. Time switches.

C. Outdoor photo controls.

1.2 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260537 - Boxes.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 260919 - Enclosed Contactors: Lighting contactors.

F. Section 265100 - Interior Lighting.

G. Section 265600 - Exterior Lighting.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

C. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2011.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.
2. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
3. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install lighting control devices until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

B. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

C. Operation and Maintenance Data: Include detailed information on device programming and setup.

D. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

A. Provide five year manufacturer warranty for all occupancy sensors.

PART 2 PRODUCTS

2.1 ALL LIGHTING CONTROL DEVICES

A. Provide products listed and classified by testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

C. Products for Switching of Electronic Fluorescent Ballasts: Tested and rated to be suitable for peak inrush currents specified in NEMA 410.

2.2 OCCUPANCY SENSORS

A. Manufacturers:
   1. Hubbell Building Automation, Inc; : www.hubbellautomation.com
   2. Sensor Switch Inc; : www.sensorswitch.com/#sle.
   3. WattStopper; : www.wattstopper.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

B. All Occupancy Sensors:
   1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
   2. Sensor Technology:
      a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
      b. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
   3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
   4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
   5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
   6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.
   7. Turn-Off Delay: Field adjustable, up to a maximum time delay setting of not less than 5 minutes and not more than 30 minutes.
   8. Sensitivity: Field adjustable.
   9. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.
   10. Compatibility: Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
   11. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on drawings.

C. Wall Switch Occupancy Sensors:
1. All Wall Switch Occupancy Sensors:
a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
b. Unless otherwise indicated or required to control the load indicated on drawings, provide line voltage units with self-contained relay.
c. Where indicated, provide two-circuit units for control of two separate lighting loads, with separate manual controls and separately programmable operation for each load.
d. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
e. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
f. Finish: Match finishes specified for wiring devices in Section 262726, unless otherwise indicated.
2. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 300 square feet for minor motion and 1050 square feet for major motion.
a. Products:
1) Wattstopper #DW-100-G.
2) Substitutions: See Section 016000 - Product Requirements.

D. Ceiling Mounted Occupancy Sensors:
1. All Ceiling Mounted Occupancy Sensors:
a. Description: Low profile occupancy sensors designed for ceiling installation.
b. Unless otherwise indicated or required to control the load indicated on the drawings, provide line voltage units with self-contained relay.
c. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
d. Finish: White unless otherwise indicated.
2. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
a. Standard Range Sensors: Capable of detecting motion within an area of 1000 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
1) Products:
(a) Wattstopper #DT-355.
(b) Substitutions: See Section 016000 - Product Requirements.

2.3 TIME SWITCHES

A. Manufacturers:
1. Intermatic, Inc; _____: www.intermatic.com/#sle.
2. Paragon, a brand of Invensys Controls; _____: www.invensyscontrols.com.
3. Tork, a division of NSI Industries LLC; _____: www.tork.com/#sle.

B. Digital Electronic Time Switches:
1. Description: Factory-assembled solid state programmable controller with LCD display, listed and labeled as complying with UL 916 or UL 917.
2. Program Capability:
a. 7-Day Time Switches: Single channel, capable of different schedule for each day of the week with additional holiday schedule available to override normal schedule for selected days.
3. Schedule Capacity: Not less than 16 programmable on/off operations.
4. Provide automatic daylight savings time and leap year compensation.
5. Provide power outage backup to retain programming and maintain clock.
6. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
7. Input Supply Voltage: As indicated on the drawings.

8. Provide lockable enclosure; environmental type per NEMA 250 as specified for the following installation locations:
    a. Indoor clean, dry locations: Type 1.

2.4 OUTDOOR PHOTO CONTROLS

A. Manufacturers:
1. Intermatic, Inc; : www.intermatic.com/#sle.
2. Kele; www.kele.com
3. Paragon, a brand of Invensys Controls; : www.invensyscontrols.com.
4. Tork, a division of NSI Industries LLC; : www.tork.com/#sle.
5. Substitutions: See Section 016000 - Product Requirements.
6. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

B. Stem-Mounted Outdoor Photo Controls:
1. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.
2. Housing: Weatherproof, impact resistant polycarbonate.
3. Photo Sensor: Cadmium sulfide.
4. Provide external sliding shield for field adjustment of light level activation.
5. Light Level Activation: 1 to 5 footcandles turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
6. Voltage: 120 V unless otherwise indicated.
7. Failure Mode: Fails to the on position.
8. Load Rating: 1,800 W for tungsten load or 1,000 VA for ballast load.
9. Products:
    a. Intermatic #K4221C
    b. Substitutions: See Section 01600 - Product Requirements

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130.

B. Coordinate locations of outlet boxes provided under Section 260537 as required for installation of lighting control devices provided under this section.
1. Mounting Heights: As indicated on the drawings.

2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.

C. Install lighting control devices in accordance with manufacturer's instructions.

D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

E. Install lighting control devices plumb and level, and held securely in place.

F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 262726.

G. Provide required supports in accordance with Section 260529.

H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

I. Occupancy Sensor Locations:
   1. Location Adjustments: Within the design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage.
   2. Locate dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

J. Outdoor Photo Control Locations:
   1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.
   2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.

K. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.

L. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.

M. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

3.4 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each lighting control device for damage and defects.

C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area.

D. Test outdoor photo controls to verify proper operation, including time delays where applicable.

E. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.5 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.

C. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on dual technology occupancy sensor lenses to block undesired motion detection.

D. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Architect.

3.6 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.7 CLOSEOUT ACTIVITIES

A. Training: Train owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of two hours of training.
   3. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of the installed lighting control devices.
   4. Location: At project site.

END OF SECTION 260923

SECTION 262100

LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical service requirements.

1.2 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260529 - Hangers and Supports for Electrical Systems.

D. Section 260534 - Conduit.

E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

F. Section 262413 - Switchboards: Service entrance equipment.

G. Section 262818 - Enclosed Switches: Service entrance equipment.

1.3 REFERENCE STANDARDS

A. IEEE C2 - National Electrical Safety Code; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify the following with Utility Company representative:
      a. Utility Company requirements, including division of responsibility.
      b. Exact location and details of utility point of connection.
      c. Utility easement requirements.
      d. Utility Company charges associated with providing service.
   2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for electrical service and associated equipment.
   3. Coordinate arrangement of service entrance equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Arrange for Utility Company to provide permanent electrical service. Prepare and submit documentation required by Utility Company.

C. Utility Company charges associated with providing permanent service to be paid by Owner.

D. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Utility Company representative.

E. Scheduling:
   1. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.5 QUALITY ASSURANCE

A. Comply with the following:
   1. IEEE C2 (National Electrical Safety Code).
   2. NFPA 70 (National Electrical Code).
   3. The requirements of the Utility Company.

PART 2 PRODUCTS

2.1 ELECTRICAL SERVICE REQUIREMENTS

A. Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.

B. Electrical Service Characteristics:
   1. Service Type: Underground.
   2. Service Voltage: 208Y/120 V, 3 phase, 60 Hz.

C. Utility Company: As indicated on drawings.

D. Division of Responsibility: As indicated on drawings.

E. Products Furnished by Contractor: Comply with Utility Company requirements.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions and Utility Company requirements.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Provide required support and attachment components in accordance with Section 260529.

E. Provide grounding and bonding for service entrance equipment in accordance with Section 260526.

F. Identify service entrance equipment, including main service disconnect(s) in accordance with Section 260553.

END OF SECTION 262100

SECTION 262416

PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Load centers.

D. Overcurrent protective devices for panelboards.

1.2 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NECA 407 - Standard for Installing and Maintaining Panelboards; 2009.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

D. NEMA PB 1 - Panelboards; 2011.

E. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.

F. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

J. UL 67 - Panelboards; Current Edition, Including All Revisions.

K. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

L. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

M. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

N. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. 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 for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
   1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.

B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
   1. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
   2. Include documentation of listed series ratings upon request.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

E. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Panelboard Keys: Two of each different key.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

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 written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:
   1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Siemens Industry, Inc: www.usa.siemens.com.

B. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

C. Substitutions: See Section 016000 - Product Requirements.

D. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2 ALL PANELBOARDS

A. Provide products listed and labeled by testing firm acceptable to the authority having jurisdiction as suitable for the purpose indicated.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. Ambient Temperature:

a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

C. Short Circuit Current Rating:
1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
2. Listed series ratings are acceptable, except where not permitted by motor contribution according to NFPA 70.
3. Label equipment utilizing series ratings as required by NFPA 70.

D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
a. Indoor Clean, Dry Locations: Type 1.
2. Boxes: Galvanized steel unless otherwise indicated.
a. Provide wiring gutters sized to accommodate the conductors to be installed.
b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.
3. Fronts:
a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
4. Lockable Doors: All locks keyed alike unless otherwise indicated.

I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

J. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs and feeders as indicated or as required to interconnect sections.

K. Load centers are not acceptable.

L. Provide the following features and accessories where indicated or where required to complete installation:
1. Feed-through lugs.
2. Sub-feed lugs.

2.3 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
1. Phase and Neutral Bus Material: Aluminum or copper.
2. Ground Bus Material: Aluminum or copper.

D. Circuit Breakers:
1. Provide bolt-on type.

2. Provide thermal magnetic circuit breakers unless otherwise indicated.

E. Enclosures:
1. Provide surface-mounted enclosures unless otherwise indicated.
2. Fronts: Provide trims to cover access to load terminals, wiring gutters, and other live parts, with exposed access to overcurrent protective device handles.
3. Service entrance panelboards

2.4 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
2. Phase and Neutral Bus Material: Aluminum or copper.
3. Ground Bus Material: Aluminum or copper.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:
1. Provide surface-mounted or flush-mounted enclosures as indicated.
2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide clear plastic circuit directory holder mounted on inside of door.

2.5 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489; ratings, configurations, and features as indicated on the drawings.
2. Interrupting Capacity:
a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated.
b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
c. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.
3. Conductor Terminations:
a. Provide mechanical lugs unless otherwise indicated.
b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
6. Provide the following circuit breaker types where indicated:
a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
d. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.

7. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.
8. Do not use tandem circuit breakers.
9. Do not use handle ties in lieu of multi-pole circuit breakers.
10. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
11. Provide the following features and accessories where indicated or where required to complete installation:
    a. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

2.6 SOURCE QUALITY CONTROL

A. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install panelboards securely, in a neat and workmanlike manner in accordance with NECA 1 (general workmanship), NECA 407 (panelboards), and NEMA PB 1.1.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required supports in accordance with Section 260529.

E. Install panelboards plumb.

F. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

G. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

H. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling.

I. Provide grounding and bonding in accordance with Section 260526.

J. Install all field-installed branch devices, components, and accessories.

K. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.

L. Provide filler plates to cover unused spaces in panelboards.

M. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
    1. Fire detection and alarm circuits.
    2. Communications equipment circuits.

N. Identify panelboards in accordance with Section 260553.

3.3 FIELD QUALITY CONTROL

A. Perform inspection, testing, and adjusting in accordance with Section 014000.

B. Inspect and test in accordance with NETA STD ATS, except Section 4.

C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA STD ATS, Section 7.6.1.1 for all main circuit breakers. Tests listed as optional are not required.

D. Test GFCI circuit breakers to verify proper operation.

E. Test AFCI circuit breakers to verify proper operation.

F. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

3.5 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 262416

SECTION 262717

EQUIPMENT WIRING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical connections to equipment.

1.2 RELATED REQUIREMENTS

A. Section 260534 - Conduit.

B. Section 260519 - Low-Voltage Electrical Power Conductors and Cables (600 V and Less).

C. Section 260537 - Boxes.

D. Section 262726 - Wiring Devices.

E. Section 262818 - Enclosed Switches.

1.3 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (R 2010).

B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2012.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
   2. Determine connection locations and requirements.

B. Sequencing:
   1. Install rough-in of electrical connections before installation of equipment is required.
   2. Make electrical connections before required start-up of equipment.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide wiring device manufacturer’s catalog information showing dimensions, configurations, and construction.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
   1. Colors: Conform to NEMA WD 1.
   2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
   3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

B. Disconnect Switches: As specified in Section 16412 .

C. Wiring Devices: As specified in Section 262726.

D. Flexible Conduit: As specified in Section 260534.

E. Wire and Cable: As specified in Section 260519.

F. Boxes: As specified in Section 260537.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible metal conduit. Use liquidtight flexible metal conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION 262717

SECTION 262726

WIRING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall switches.

B. Wall dimmers.

C. Receptacles.

D. Wall plates.

1.2 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260537 - Boxes.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 260923 - Lighting Control Devices: Devices for automatic control of lighting, including occupancy sensors.

E. Section 262717 - Equipment Wiring: Cords and plugs for equipment.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

C. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (R 2010).

D. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2012.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

G. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

H. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

I. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
3. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
4. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install wiring devices until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

C. Operation and Maintenance Data:

1. GFI Receptacles: Include information on status indicators and testing procedures and intervals.

D. Project Record Documents: Record actual installed locations of wiring devices.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Arrow Hart, a brand of Cooper Industries; www.cooperindustries.com

B. Hubbell Incorporated; : www.hubbell-wiring.com.

C. Leviton Manufacturing Company, Inc; : www.leviton.com.

D. Pass & Seymour, a brand of Legrand North America, Inc; : www.legrand.us

E. Substitutions: See Section 016000 - Product Requirements.

F. Source Limitations: Where possible, for each type of wiring device furnish products produced by a single manufacturer and obtained from a single supplier.

2.2 APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

C. Provide weather resistant GFI receptacles with specified weatherproof covers for all receptacles installed outdoors or in damp or wet locations.

D. Provide GFI protection for all receptacles installed within 6 feet of sinks.

E. Provide GFCI protection for receptacles installed in kitchens.

F. Provide GFCI protection for receptacles serving electric drinking fountains.

G. Unless noted otherwise, do not use combination switch/receptacle devices.

2.3 ALL WIRING DEVICES

A. Provide products listed and classified by testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

B. Finishes:
   1. Wiring Devices Installed in Finished Spaces: Colors as selected by Architect with stainless steel wall plate unless otherwise indicated. Multiple colors may be selected.
   2. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate unless otherwise indicated.
   3. Wiring Devices Installed in Wet or Damp Locations: Gray with specified weatherproof cover unless otherwise indicated.

2.4 WALL SWITCHES

A. All Wall Switches: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

B. Standard Wall Switches: Commercial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.5 WALL DIMMERS

A. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.

B. Control: Slide control type with separate on/off switch.

C. Power Rating, Unless Otherwise Indicated or Required to Control the Load Indicated on the Drawings:
   1. Incandescent: 2000 W.
   2. 0-10V LED: 1500 VA

2.6 RECEPTACLES

A. All Receptacles: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
   2. NEMA configurations specified are according to NEMA WD 6.

B. Convenience Receptacles:
   1. Standard Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
   2. Weather Resistant Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
   3. Tamper Resistant Convenience Receptacles (All receptacles on third floor): Commercial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.

C. GFI Receptacles:
   1. All GFI Receptacles: Provide with feed-through protection, light to indicate ground fault tripped condition and loss of protection, and list as complying with UL 943, class A.
      a. Provide test and reset buttons of same color as device.
   2. Standard GFI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
   3. Weather Resistant GFI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.
   4. Tamper Resistant GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.

2.7 WALL PLATES

A. All Wall Plates: Comply with UL 514D.
   1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
   2. Size: Standard; .
   3. Screws: Metal with slotted heads finished to match wall plate finish.

B. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

C. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.

D. Weatherproof Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.

E. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

F. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130.

B. Coordinate locations of outlet boxes provided under Section 260537 as required for installation of wiring devices provided under this section.
   1. Mounting Heights: As indicated on the drawings.
   2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
   3. Where multiple receptacles or wall switches are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
   4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
   5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Provide GFI receptacles with integral GFI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

I. Where split-wired duplex receptacles are indicated, remove tabs connecting top and bottom receptacles.

J. Install wiring devices plumb and level with mounting yoke held rigidly in place.

K. Install wall switches with OFF position down.

L. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

M. Do not share neutral conductor on branch circuits utilizing wall dimmers.

N. Install vertically mounted receptacles with grounding pole on bottom and horizontally mounted receptacles with grounding pole on left.

O. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

P. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

Q. Identify wiring devices in accordance with Section 260553.

3.4 FIELD QUALITY CONTROL

A. Perform field inspection, testing, and adjusting in accordance with Section 014000.

B. Inspect each wiring device for damage and defects.

C. Operate each wall switch with circuit energized to verify proper operation.

D. Test each receptacle to verify operation and proper polarity.

E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.5 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.6 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION 262726

SECTION 262813

FUSES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fuses.

1.2 RELATED REQUIREMENTS

A. Section 262818 - Enclosed Switches: Fusible switches.

1.3 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.

D. UL 248-8 - Low-Voltage Fuses - Part 8: Class J Fuses; Current Edition, Including All Revisions.

E. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
      a. Fusible Enclosed Switches: See Section 262818.
   2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
   3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.

B. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Fuses: One set(s) of three for each type and size installed.
   3. Fuse Pullers: One set(s) compatible with each type and size installed.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Cooper Bussmann, a division of Cooper Industries: www.cooperindustries.com/#sle.

B. Mersen (formerly Ferraz Shawmut): ferrazshawmut.mersen.com.

C. Littelfuse, Inc: www.littelfuse.com/#sle.

D. Substitutions: See Section 016000 - Product Requirements.

2.2 APPLICATIONS

A. Feeders:
   1. Fusible Switches up to 600 Amperes: Class J, time-delay.

B. General Purpose Branch Circuits: Class RK1, time-delay.

2.3 FUSES

A. Provide products listed and classified by testing firm acceptable to the authority having jurisdiction as suitable for the purpose indicated.

B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.

C. Provide fuses of the same type, rating, and manufacturer within the same switch.

D. Comply with UL 248-1.

E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.

F. Voltage Rating: Suitable for circuit voltage.

G. Class R Fuses: Comply with UL 248-12.

H. Class J Fuses: Comply with UL 248-8.

I. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

J. Provide the following accessories where indicated or where required to complete installation:
   1. Fuseholders: Compatible with indicated fuses.
   2. Fuse Reducers: For adapting indicated fuses to permit installation in switch designed for fuses with larger ampere ratings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.

B. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Do not install fuses until circuits are ready to be energized.

B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION 262813

SECTION 262818

ENCLOSED SWITCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Enclosed safety switches.

1.2 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 262813 - Fuses.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

F. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

G. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
4. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

D. 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 starting of product.

E. Project Record Documents: Record actual locations of enclosed switches.

F. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. 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.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain ambient temperature between -22 degrees F and 104 degrees F during and after installation of enclosed switches.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Siemens Industry, Inc: www.usa.siemens.com.

B. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

C. Substitutions: See Section 016000 - Product Requirements.

D. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break, enclosed safety switches complying with NEMA KS 1, type HD (heavy duty), and listed and labeled as complying with UL 98; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed and labeled by testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. Ambient Temperature: Between -22 degrees F and 104 degrees F.

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Provide with switch blade contact position that is visible when the cover is open.

G. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
   1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

J. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

K. Enclosures: Comply with NEMA KS 1 and NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.

2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.

L. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

M. Heavy Duty Switches:
1. Conductor Terminations:
a. Provide mechanical lugs unless otherwise indicated.
b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed safety switches.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install enclosed switches in accordance with manufacturer's instructions.

B. Install enclosed switches securely, in a neat and workmanlike manner in accordance with NECA 1.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required supports in accordance with Section 260529.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 260526.

H. Provide fuses complying with Section 262813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

I. Identify enclosed switches in accordance with Section 260553.

3.3 FIELD QUALITY CONTROL

A. Perform field inspection, testing, and adjusting in accordance with Section 014000.

B. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.5 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 262818

SECTION 265100

INTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

D. Ballasts.

E. Fluorescent emergency power supply units.

F. Lamps.

G. Luminaire accessories.

1.2 RELATED REQUIREMENTS

A. Section 260537 - Boxes.

B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

C. Section 260919 - Enclosed Contactors: Lighting contactors.

D. Section 260923 - Lighting Control Devices: Automatic controls for lighting including occupancy sensors.

E. Section 262726 - Wiring Devices: Manual wall switches.

F. Section 265600 - Exterior Lighting.

1.3 REFERENCE STANDARDS

A. ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts - Supplements; 2011.

B. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Cor 1, 2012).

C. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; Illuminating Engineering Society; 2008.

D. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; Illuminating Engineering Society; 2015.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

F. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.

G. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

H. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. NFPA 101 - Life Safety Code; 2015.

K. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

L. UL 935 - Fluorescent-Lamp Ballasts; Current Edition, Including All Revisions.

M. UL 1598 - Luminaires; Current Edition, Including All Revisions.

N. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting.

Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.

2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
4. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS

A. Shop Drawings:
   1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.
   2. Lamps: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.
   3. Fluorescent Emergency Power Supply Unit: Include list of compatible lamp configurations and associated lumen output.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Lamps: Ten percent of total quantity installed for each type, but not less than two of each type.
   3. Extra Ballasts: Two percent of total quantity installed for each type, but not less than one of each type.

F. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide two year manufacturer warranty for all linear fluorescent ballasts.

C. Provide five year pro-rata warranty for batteries for emergency lighting units.

D. Provide ten year pro-rata warranty for batteries for self-powered exit signs.

E. Provide five year full warranty for fluorescent emergency power supply units.

PART 2 PRODUCTS

2.1 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

B. Substitutions: See Section 016000 - Product Requirements.

2.2 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed and classified by Underwriters Laboratories Inc. or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Recessed Luminaires:
   1. Ceiling Compatibility: Comply with NEMA LE 4.

H. Fluorescent Luminaires:
   1. Provide ballast disconnecting means complying with NFPA 70 where required.
   2. Fluorescent Luminaires Controlled by Occupancy Sensors: Provide programmed start ballasts.
   3. Fluorescent Luminaires Controlled by Dual-Level Switching: Provide with two ballasts.

I. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

J. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

2.3 EMERGENCY LIGHTING UNITS

A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

C. Battery:
   1. Sealed maintenance-free lead calcium unless otherwise indicated.
   2. Size battery to supply all connected lamps, including emergency remote heads where indicated.

D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

F. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

2.4 EXIT SIGNS

A. All Exit Signs: Internally illuminated with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
   1. Number of Faces: Single or double as indicated or as required for the installed location.
   2. Directional Arrows: As indicated or as required for the installed location.

B. Self-Powered Exit Signs:
   1. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
   2. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
   3. Provide low-voltage disconnect to prevent battery damage from deep discharge.
   4. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

2.5 BALLASTS

A. Manufacturers:
   1. General Electric Company/GE Lighting; : www.gelighting.com/#sle.
   2. Osram Sylvania; : www.sylvania.com/#sle.
   3. Philips Lighting Electronics/Advance; : www.advance.philips.com.
   4. Substitutions: See Section 016000 - Product Requirements.
   5. Manufacturer Limitations: Where possible, for each type of luminaire provide ballasts produced by a single manufacturer.

B. All Ballasts:
   1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
   2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

C. Fluorescent Ballasts:
   1. All Fluorescent Ballasts: Unless otherwise indicated, provide high frequency electronic ballasts complying with ANSI C82.11 and listed and labeled as complying with UL 935.
      a. Input Voltage: Suitable for operation at voltage of connected source, with variation tolerance of plus or minus 10 percent.
      b. Total Harmonic Distortion: Not greater than 10 percent.
      c. Power Factor: Not less than 0.95.
      d. Ballast Factor: Normal ballast factor between 0.85 and 1.15, unless otherwise indicated.
      e. Thermal Protection: Listed and labeled as UL Class P, with automatic reset for integral thermal protectors.
      f. Sound Rating: Class A, suitable for average ambient noise level of 20 to 24 decibels.
      g. Lamp Compatibility: Specifically designed for use with the specified lamp, with no visible flicker.
      h. Lamp Operating Frequency: Greater than 20 kHz, except as specified below.
      i. Lamp Current Crest Factor: Not greater than 1.7.
      j. Lamp Wiring Method:
         1) Programmed Start Ballasts: Provide parallel or series/parallel wired where available; otherwise series wired is acceptable.
      k. Provide automatic restart capability to restart replaced lamp(s) without requiring resetting of power.
      l. Provide end of lamp life automatic shut down circuitry for T5 and smaller diameter lamp ballasts.

m. Surge Tolerance: Capable of withstanding characteristic surges according to IEEE C62.41.2, location category A.
n. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of CFR, Title 47, Part 18, for Class A, non-consumer application.
o. Ballast Marking: Include wiring diagrams with lamp connections.

2. Non-Dimming Fluorescent Ballasts:
a. Lamp Starting Method:
1) T8 Lamp Ballasts: Programmed start unless otherwise indicated.
2) T5 Lamp Ballasts: Programmed start unless otherwise indicated.
3) Compact Fluorescent Lamp Ballasts: Programmed start unless otherwise indicated.
b. Lamp Starting Temperature: Capable of starting standard lamp(s) at a minimum of 0 degrees F, and energy saving lamp(s) at a minimum of 60 degrees F unless otherwise indicated.

D. Dimmable LED Drivers:
1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
2. Control Compatibility: Fully compatible with the dimming controls to be installed.

2.6 FLUORESCENT EMERGENCY POWER SUPPLY UNITS

A. Manufacturers:
1. Iota Engineering, LLC; _____: www.iotaengineering.com/#sle.
2. Philips Emergency Lighting/Bodine; _____: www.bodine.com/#sle.
3. Substitutions: See Section 016000 - Product Requirements.
4. Manufacturer Limitations: Where possible, for each type of luminaire provide fluorescent emergency power supply units produced by a single manufacturer.

B. Description: Self-contained fluorescent emergency power supply units suitable for use with indicated luminaires, complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

C. Compatibility:
1. Ballasts: Compatible with electronic, standard magnetic, energy saving, and dimming AC ballasts, including those with end of lamp life shutdown circuits.
2. Lamps: Compatible with low-mercury lamps.

D. Operation: Upon interruption of normal power source, solid-state control automatically switches connected lamp(s) to the fluorescent emergency power supply for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

E. Battery: Sealed maintenance-free high-temperature nickel cadmium unless otherwise indicated.

F. Emergency Illumination Output:
1. As indicated in Light Fixture Schedule

G. Diagnostics: Provide accessible and visible multi-chromatic combination test switch/indicator light to display charge, test, and diagnostic status and to manually activate emergency operation.

H. Operating Temperature: From 32 degrees F to 122 degrees F unless otherwise indicated or required for the installed location.

2.7 LAMPS

A. Manufacturers:
1. General Electric Company/GE Lighting; _____: www.gelighting.com/#sle.
2. Osram Sylvania; _____: www.sylvania.com/#sle.
3. Philips Lighting Company; _____: www.lighting.philips.com.
4. Substitutions: See Section 016000 - Product Requirements.
5. Manufacturer Limitations: Where possible, provide lamps produced by a single manufacturer.

B. All Lamps:
1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.

2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect to be inconsistent in perceived color temperature.

C. Incandescent Lamps: Wattage and bulb type as indicated, with base type as required for lighting fixture; 130 V rated.
1. Non-Reflector Type Incandescent Lamps: Inside frosted lamp finish unless otherwise indicated.

D. Compact Fluorescent Lamps: Wattage and bulb type as indicated, with base type as required for luminaire.
1. Low Mercury Content: Provide lamps that pass the EPA Toxicity Characteristic Leaching Procedure (TCLP) test for characteristic hazardous waste.
2. Correlated Color Temperature (CCT): 3,000 K unless otherwise indicated.
3. Color Rendering Index (CRI): Not less than 80.
4. Average Rated Life: Not less than 10,000 hours for an operating cycle of three hours per start.

E. Linear Fluorescent Lamps: Wattage and bulb type as indicated, with base type as required for luminaire.
1. Low Mercury Content: Provide lamps that pass the EPA Toxicity Characteristic Leaching Procedure (TCLP) test for characteristic hazardous waste.
2. T8 Linear Fluorescent Lamps:
a. Correlated Color Temperature (CCT): 3,000 K unless otherwise indicated.
b. Color Rendering Index (CRI): Not less than 80.
c. Average Rated Life: Not less than 20,000 hours for an operating cycle of three hours per start.
3. T5 Linear Fluorescent Lamps:
a. Correlated Color Temperature (CCT): 3,000 K unless otherwise indicated.
b. Color Rendering Index (CRI): Not less than 80.
c. Average Rated Life: Not less than 20,000 hours for an operating cycle of three hours per start.

2.8 ACCESSORIES

A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 260537 as required for installation of luminaires provided under this section.

B. Install products according to manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship), NECA 500 (commercial lighting), and NECA 502 (industrial lighting).

D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

E. Suspended Ceiling Mounted Luminaires:
   1. Do not use ceiling tiles to bear weight of luminaires.
   2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
   3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.
   4. Secure pendant-mounted luminaires to building structure.
   5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
   6. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gage, connected from opposing corners of each recessed luminaire to building structure.
   7. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

F. Recessed Luminaires:
   1. Install trims tight to mounting surface with no visible light leakage.
   2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.

G. Suspended Luminaires:
   1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
   2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
   3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet in length, with no more than 4 feet between supports.
   4. Install canopies tight to mounting surface.
   5. Unless otherwise indicated, support pendants from swivel hangers.

H. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

I. Install accessories furnished with each luminaire.

J. Bond products and metal accessories to branch circuit equipment grounding conductor.

K. Fluorescent Luminaires Controlled by Dual-Level Switching: Connect such that each switch controls the same corresponding lamps in each luminaire.

L. Emergency Lighting Units:
   1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

M. Exit Signs:
   1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

N. Fluorescent Emergency Power Supply Units:
   1. For field-installed units, install inside luminaire unless otherwise indicated. Where installation inside luminaire is not possible, install on top of luminaire.
   2. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal ballast(s) in luminaire. Bypass local switches, contactors, or other lighting controls.

O. Install lamps in each luminaire.

P. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

3.4 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.

E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.5 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.

C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

3.6 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.7 CLOSEOUT ACTIVITIES

A. Just prior to Substantial Completion, replace all lamps that have failed.

3.8 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION 265100

SECTION 265600

EXTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Exterior luminaires.

B. Poles and accessories.

1.2 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260537 - Boxes.

D. Section 260919 - Enclosed Contactors: Lighting contactors.

E. Section 260923 - Lighting Control Devices: Automatic controls for lighting including outdoor photo controls.

1.3 REFERENCE STANDARDS

A. ANSI C82.4 - American National Standard for Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type); 2002.

B. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; Illuminating Engineering Society; 2008.

C. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; Illuminating Engineering Society; 2015.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

E. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2006.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 1598 - Luminaires; Current Edition, Including All Revisions.

H. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
2. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:
   a. Include estimated useful life, calculated based on IES LM-80 test data.
2. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.

C. Certificates for Poles and Accessories: Manufacturer's documentation that products are suitable for the luminaires to be installed.

D. 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 starting of product.

E. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Touch-Up Paint: 2 gallons, to match color of pole finish.

G. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.8 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.1 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the Drawings.

B. Substitutions: See Section 016000 - Product Requirements.

2.2 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed and classified by testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

H. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.3 POLES

A. All Poles:

1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
2. Structural Design Criteria:
    a. Wind Load: Include effective projected area (EPA) of luminaire(s) and associated supports and accessories to be installed.
        1) Design Wind Speed: 100 miles per hour, with gust factor of 1.3.
    b. Dead Load: Include weight of proposed luminaire(s) and associated supports and accessories.
3. Material: Steel, unless otherwise indicated.
4. Shape: Round straight, unless otherwise indicated.
5. Finish: Match luminaire finish, unless otherwise indicated.
6. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.
7. Unless otherwise indicated, provide with the following features/accessories:
    a. Top cap.
    b. Handhole.
    c. Anchor bolts with leveling nuts or leveling shims.
    d. Anchor base cover.

B. Metal Poles: Provide ground lug, accessible from handhole.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 260537 as required for installation of luminaires provided under this section.

B. Install products according to manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship) and NECA/IESNA 501 (exterior lighting).

D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

E. Recessed Luminaires:
1. Install trims tight to mounting surface with no visible light leakage.

F. Pole-Mounted Luminaires:
1. Foundation-Mounted Poles:
    a. Provide cast-in-place concrete foundations for poles as indicated, in accordance with Section 033000.
        1) Install anchor bolts plumb per template furnished by pole manufacturer.
        2) Position conduits to enter pole shaft.
    b. Install foundations plumb.
    c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
    d. Tighten anchor bolt nuts to manufacturer's recommended torque.

e. Install non-shrink grout between pole anchor base and concrete foundation, leaving small channel for condensation drainage.
f. Install anchor base covers as indicated.

2. Grounding:
   a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
   b. Provide supplementary ground rod electrode as specified in Section 260526 at each pole bonded to grounding system as indicated.
3. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.

G. Install accessories furnished with each luminaire.

H. Bond products and metal accessories to branch circuit equipment grounding conductor.

I. Install lamps in each luminaire.

3.4 FIELD QUALITY CONTROL

A. Inspect each product for damage and defects.

B. Operate each luminaire after installation and connection to verify proper operation.

C. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.5 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B. Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by Architect.

3.6 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.7 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION 265600

SECTION 283100

FIRE DETECTION AND ALARM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire alarm system design and installation, including all components, wiring, and conduit.

B. Transmitters for communication with supervising station.

C. Maintenance of fire alarm system under contract for specified warranty period.

1.2 RELATED REQUIREMENTS

A. Section 211300 - Fire-Suppression Sprinkler Systems: Supervisory, alarm, and actuating devices installed in sprinkler system.

B. Section 142010 - Passenger Elevators: Elevator systems monitored and controlled by fire alarm system.

1.3 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Cor 1, 2012).

C. IEEE C62.41 - IEEE Recommended Practice on Surge Voltages in Low-Voltage Power Circuits; 1991 (R1995).

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. NFPA 72 - National Fire Alarm and Signaling Code; 2016.

F. NFPA 101 - Life Safety Code; 2015.

1.4 SUBMITTALS

A. Proposal Documents: Submit the following with cost/time proposal:
   1. NFPA 72 "Record of Completion", filled out to the extent known at the time.
   2. Manufacturer's detailed data sheet for each control unit, initiating device, and notification appliance.
   3. Certification by Contractor that the system design will comply with the contract documents.
   4. Proposed maintenance contract.

B. Evidence of designer qualifications.

C. 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. Copy (if any) of list of data required by authority having jurisdiction.
   2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
   3. 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.
   4. System zone boundaries and interfaces to fire safety systems.
   5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
   6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
   7. List of all devices on each signaling line circuit, with spare capacity indicated.
   8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
   9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.

10. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
11. Certification by the manufacturer of the control unit that the system design complies with the contract documents.
12. Certification by Contractor that the system design complies with the contract documents.

D. Evidence of installer qualifications.

E. Evidence of maintenance contractor qualifications, if different from installer.

F. Inspection and Test Reports:
1. Submit inspection and test plan prior to closeout demonstration.
2. Submit documentation of satisfactory inspections and tests.
3. Submit NFPA 72 "Inspection and Test Form," filled out.

G. Operating and Maintenance Data: Revise and resubmit until acceptable; have one set available during closeout demonstration:
1. Complete set of specified design documents, as approved by authority having jurisdiction.
2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
3. Contact information for firm that will be providing contract maintenance and trouble call-back service.
4. List of recommended spare parts, tools, and instruments for testing.
5. Replacement parts list with current prices, and source of supply.
6. Detailed troubleshooting guide and large scale input/output matrix.
7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.

H. Project Record Documents: Have one set available during closeout demonstration:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
2. "As installed" wiring and schematic diagrams, with final terminal identifications.
3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.

I. Closeout Documents:
1. Certification by manufacturer that the system has been installed in compliance with his installation requirements, is complete, and is in satisfactory operating condition.
2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.
3. Certificate of Occupancy.
4. Maintenance contract.

1.5 QUALITY ASSURANCE

A. Designer Qualifications: Registered 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. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
2. Installer Personnel: At least 2 years of experience installing fire alarm systems.
3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.

C. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6 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

2.1 MANUFACTURERS

A. Fire Alarm Control Units: Provided their products meet or exceed the performance of the basis of design product, products of the following are acceptable:
1. Honeywell Security & Fire Solutions/Notifier: www.notifier.com/#sle.
2. Siemens Building Technologies, Inc: www.usa.siemens.com/#sle.
3. Provide all control units made by the same manufacturer.

B. Initiating Devices, and Notification Appliances:
1. Same manufacturer as control units.
2. Provide all initiating devices and notification appliances made by the same manufacturer.

C. Substitutions: Not permitted.

2.2 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 the contract documents or not.
2. Protected Premises: Entire building.
3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
a. ADA Standards for Accessible Design.
b. The requirements of the State Fire Marshal.
c. The requirements of the local authority having jurisdiction .
d. Applicable local codes.
e. The contract documents (drawings and specifications).
f. NFPA 101.
g. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
4. Evacuation Alarm: general evacuation of entire premises.
5. Hearing Impaired Occupants: Provide visible notification devices in all public areas and in dwelling units.
6. Master Control Unit (Panel): New, location shown on plans .
7. Combined Systems: Do not combine fire alarm system with other non-fire systems.

B. Supervising Stations and Fire Department Connections:
1. Public Fire Department Notification: By on-premises 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. Circuits:
1. Initiating Device Circuits (IDC): Class A, Style D.
2. Signaling Line Circuits (SLC) : Class A, Style 6.
3. Notification Appliance Circuits (NAC): Class B, Style Y.

D. Spare Capacity:
   1. Initiating Device Addresses: Minimum 25 percent spare capacity.
   2. Notification Appliance Circuits: Minimum 25 percent spare capacity.
   3. Master Control Unit: Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.

E. 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.

2.3 FIRE SAFETY SYSTEMS INTERFACES

A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
   1. Sprinkler/standpipe water control valves.
   2. Elevator shut-down control circuits.

B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
   1. Sprinkler water flow.
   2. Elevator lobby, elevator hoistway, and elevator machine room smoke detectors.
   3. Smoke and heat detectors.
   4. Manual Pull Stations.

C. Elevators:
   1. Elevator lobby, hoistway, and machine room smoke detectors: Elevator recall for fire fighters' service.
   2. Elevator Machine Room and hoistway Heat Detectors: Shut down elevator power prior to hoistway sprinkler activation.

2.4 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, Initiating Devices, and Notification Appliances: Analog, addressable type; listed by Underwriters Laboratories as suitable for the purpose intended.

C. Master Control Unit: As specified above.

D. Remote Annunciators: LCD display; .

E. Initiating Devices:
   1. Manual Pull Stations: Dual Action, non-coded, RED with white "FIRE" lettering.
   2. Smoke Detectors: Photoelectric, Addressable.
   3. Heat Detectors: Fixed temperature and Rate-of-Rise.
   4. Addressable Interface Devices.
      a. Provide 1 extra.

F. Notification Appliances:
   1. Bells.
   2. Horns: Wall mounted, RED with white "FIRE" lettering, Temporal pattern.
   3. Strobes: Wall mounted, RED with white "FIRE" lettering, Multi-candela selectable.
   4. Horn/Strobes: Wall mounted, RED with white "FIRE" lettering.

G. Miscellaneous:
   1. Door Holders: 24V Electromagnetic, Flush wall-mount FM998

H. Circuit Conductors: Copper; provide 200 feet extra; color code and label.

I. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.
   1. Equipment Connected to Alternating Current Circuits: Maximum let through voltage of 350 V(ac), line-to-neutral, and 350 V(ac), line-to-line; do not use fuses.

J. Locks and Keys: Deliver keys to Owner.

K. 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.
   1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
   2. Provide one for each control unit where operations are to be performed.
   3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
   4. Provide extra copy with operation and maintenance data submittal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and the contract documents.

B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.

C. Install instruction cards and labels.

D. Provide one year monitoring service.

E. Verify location of all devices with Architect prior to installation.

3.2 INSPECTION AND TESTING FOR COMPLETION

A. Notify Owner 7 days prior to beginning completion inspections and tests.

B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.

D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.

E. Provide all tools, software, and supplies required to accomplish inspection and testing.

F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.

G. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

3.3 PERSONNEL INSTRUCTION

A. Provide the following instruction to designated Owner personnel:
   1. Hands-On Instruction: On-site, using operational system.

B. Administrative: One-hour session(s) covering issues necessary for non-technical administrative staff; classroom:
   1. Initial Training: 1 session pre-closeout.

C. Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:
   1. Initial Training: 1 session pre-closeout.

D. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.

3.4 CLOSEOUT

A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
   1. Be prepared to conduct any of the required tests.

2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
3. Have authorized technical representative of control unit manufacturer present during demonstration.
4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
5. Repeat demonstration until successful.

B. Substantial Completion of the project cannot be achieved until inspection and testing is successful and:
1. Approved operating and maintenance data has been delivered.
2. All aspects of operation have been demonstrated to Owner.
3. Final acceptance of the fire alarm system has been given by authorities having jurisdiction.
4. Occupancy permit has been granted.
5. Specified pre-closeout instruction is complete.

3.5 MAINTENANCE

A. Provide to Owner, at no extra cost, a written maintenance contract for entire manufacturer's warranty period, to include the work described below.

B. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:
1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.
2. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.
3. Record keeping required by NFPA 72 and authorities having jurisdiction.

C. Provide trouble call-back service upon notification by Owner:
1. Provide on-site response within 2 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. Provide a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.

E. Maintain a log at each fire alarm control unit, 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. Submit duplicate of each log entry to Owner's representative upon completion of site visit.

F. Comply with Owner's requirements for access to facility and security.

END OF SECTION 283100